



The Ohio Brass Co.

· Mansfield · Ohio ·



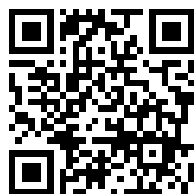
CATALOGUE
N^o 14

OVERHEAD MATERIALS RAIL BONDS
CAR EQUIPMENT SPECIALTIES &
HIGH TENSION PORCELAIN INSULATORS

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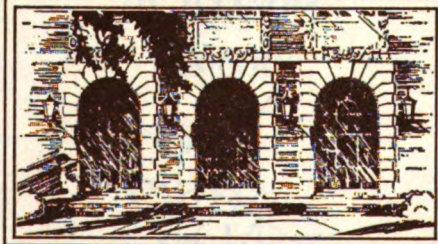
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Catalogue No. 14—1914

The Ohio Brass Co.

Designers, Engineers and
Manufacturers of a

Complete Line of Perfected Appliances Used
in the Construction, Maintenance
and Operation of

Electric Railways
Mine Haulage Systems
and Transmission Lines



Main Offices and Works:
Mansfield, Ohio, U.S. A.

Cable Address: "Electric, Mansfield"

Branch Offices:

NEW YORK
CHICAGO

30 Church Street
343 South Dearborn Street

Sales Agents in Principal Foreign Countries

O-B Progress from 1888 to 1914



Entire Plant in 1888



Factory Force in 1888



Main Offices and Works at Mansfield, Ohio, in 1914

Note:—This photograph was taken from roof of a grain elevator over four blocks distant



Partial Group of Employees at Mansfield Plant taken in 1912
Combined total of Employees at Mansfield and Barborton is 900



O-B High Tension Insulator Pottery at Barborton—Office at Mansfield

621.31937

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no. 14



Trade Mark—Registered

This Trade Mark placed on
Electric Railway and Mine
Haulage Materials or Hi-
Tension Porcelain Insulators
signifies that through **every**
step of manufacture we
honestly endeavor to follow
our watchword

Quality First!

THE OHIO BRASS CO.,
Mansfield, Ohio

992276

Remarks to Customers

1st—Liability

We exercise the utmost care in packing goods and cannot be held responsible for any damage to them while in transit. At the same time, if such cases are reported to us, we will gladly coöperate with our customers in having all claims adjusted.

2nd—How to Order

It will enable us to ship orders more promptly and with less liability of error if the catalogue number and the name in full of each article are stated; also whether shipments should be made by express or freight, and if a particular route is preferred, same should be specified.

3rd—Telegraphing

The code words distributed throughout this Catalogue, designating the various articles listed, do not conflict with the "A. B. C. Code, Fifth Edition," "Lieber's Standard," "Western Union" or our own private Telegraphic Code, and may be used in connection with any of them, where such use may seem advisable.

4th—Returning Goods

Goods should not be returned without first communicating with us to obtain our approval and the correct shipping directions; at the time such shipment is made, proper notification of it should be forwarded to us, with a memorandum of all the material sent.

5th—Prices

All prices are subject to change without notice. Where quotations have been made by letter or through salesmen, reference to same should be made in the order.

6th—Terms

Accounts are payable thirty days from date of invoice, unless subject to special terms; those overdue are liable to sight draft.

7th—Remittances

Remit by draft, money order, registered letter or express money order.

8th—Financial Standing

If you are not positive that your financial standing is known and acceptable to us, please accompany your first order with good references, or authority to draw with bill of lading, or to express C. O. D. When shipment is to be made with sight draft attached to bill of lading or by express C. O. D., sufficient funds should be sent to cover the transportation charges both ways.

**For Indexes of Code
Words, Catalogue
Numbers and Classi-
fied Materials, see
last pages of this
Catalogue.**

O-B Catenary Material in Service



Chicago, Lake Shore & South Bend Railway Co., Kensington Division

O-B Catenary Material in Service

Chicago, Lake Shore & South Bend Ry. Co.

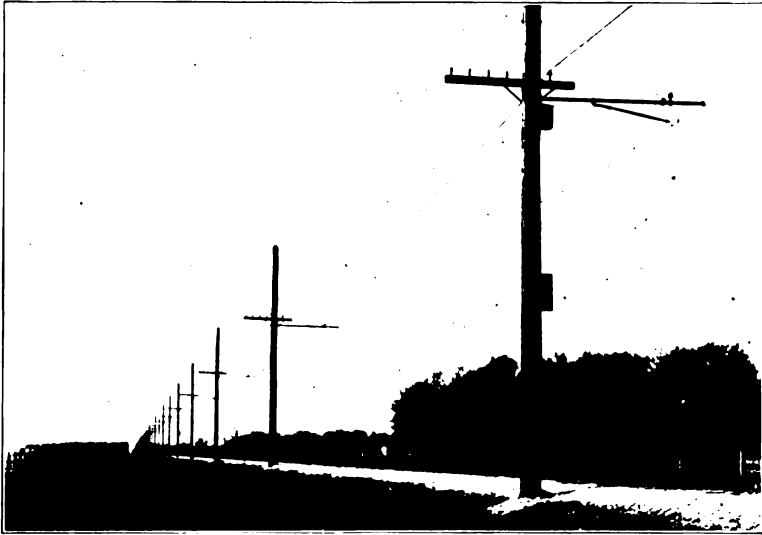
Michigan City, Ind.

Construction Details

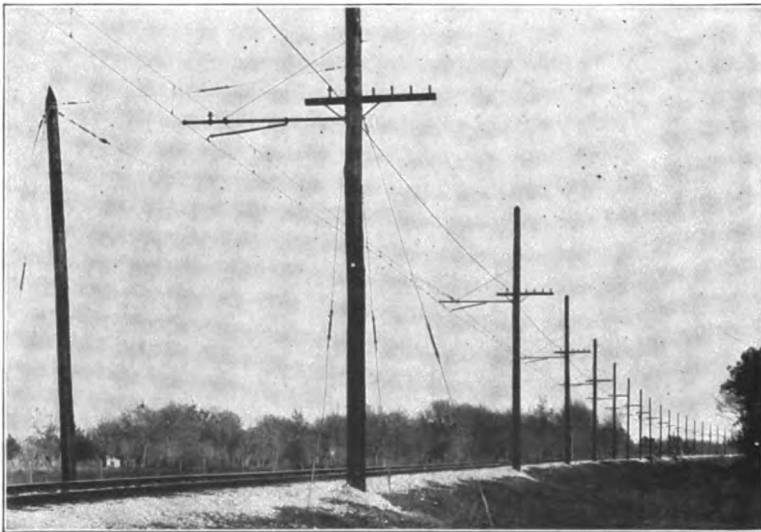
Date of Installation.....	1908-1911
Total Mileage.....	78
Trolley Voltage.....	6,600 A. C. Single Phase
Type of Construction.....	Wood poles and T-bar brackets
Pole Spacing on Tangents.....	166 feet
Hanger Spacing.....	12 feet
Size of Messenger Strand.....	1/2 inch extra strength steel
Size of Trolley Wire.....	4-0 grooved copper
Type of Collector.....	Pantograph
Type of Hanger.....	Rigid, with mechanical clamp

Remarks: On the Kensington Division a steel trolley wire has recently been suspended immediately below the regular copper trolley wire by means of a Duplex Clamp. This construction can be noted at left of illustration on opposite page.

O-B Catenary Material in Service



Galveston-Houston Electric Railway Co., Galveston, Texas



Galveston-Houston Electric Railway Co., Galveston, Texas

O-B Catenary Material in Service

Galveston-Houston Electric Ry. Co.

Galveston, Texas

Construction Details

Date of Installation.....	1911
Total Mileage.....	45
Trolley Voltage.....	600 D. C.
Type of Construction.....	Wood poles and T-bar brackets
Pole Spacing on Tangents.....	150 feet
Hanger Spacing.....	15 feet
Size of Messenger Strand . . .	7-16 inch extra high strength steel cable and $\frac{3}{8}$ in. copper clad steel cable
Size of Trolley Wire.....	4-0 grooved copper
Type of Collector.....	Trolley Wheel
Type of Hanger.....	Flexible, with extruded ear

Remarks: Poles are of creosoted pine, 40 feet long with 8 inch tops and 18 inch butts and are set in the ground to a depth of 8 feet below top of rails.

All hangers, clamps, etc. on that part of the line nearest the Gulf are made of bronze to resist corrosive effect of the salt atmosphere.

O-B Catenary Material in Service



Great Northern Railway—Cascade Tunnel Electrification



Great Northern Railway—Cascade Tunnel Electrification

O-B Catenary Material in Service

Great Northern Railway

Cascade Tunnel Electrification

Construction Details

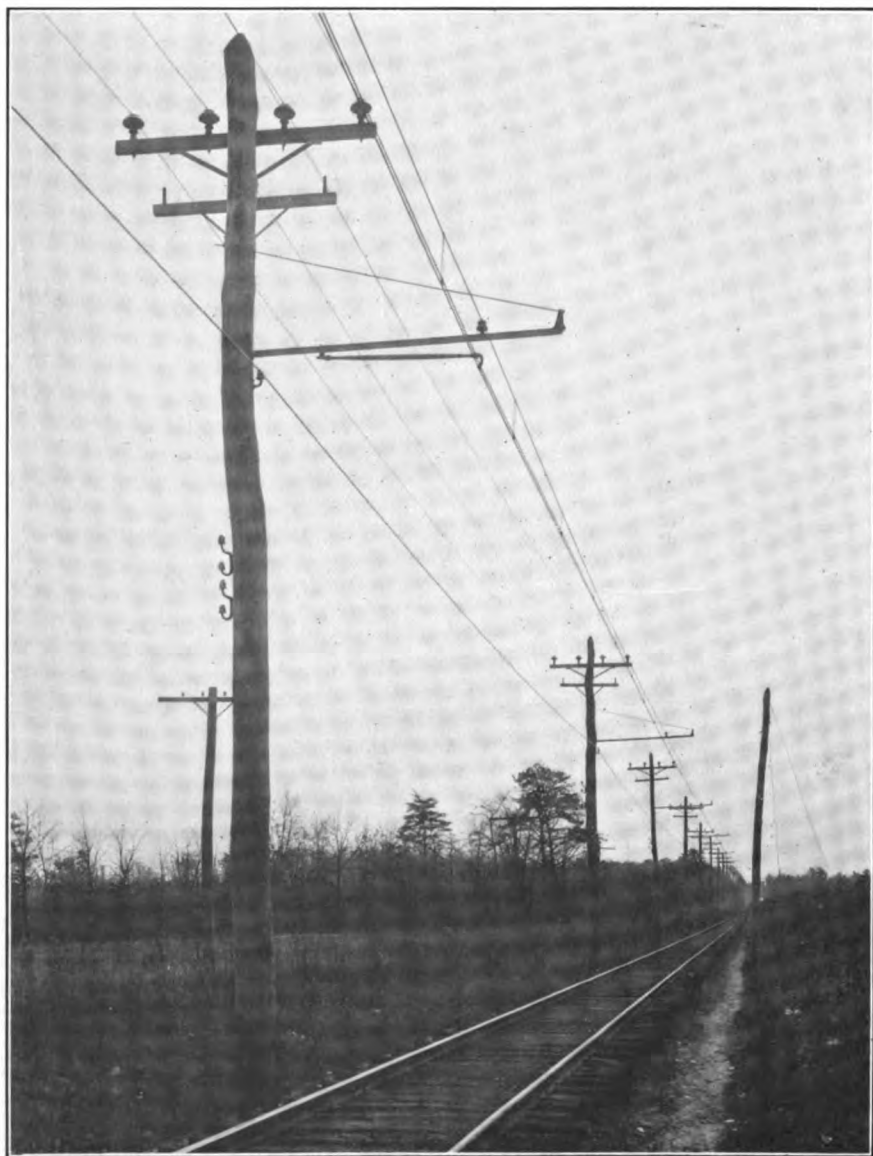
Date of Installation of Tunnel Electrification.....	1909
Total Mileage of Tunnel Electrification.....	6
Total Mileage of Outside Electrification.....	5
Trolley Voltage.....	6,600 A. C. Three Phase
Type of Construction.....	Steel bridges, wood poles with T-bar brackets and cross-span
Pole Spacing on Tangents.....	100 feet
Size of Trolley Wire.....	4-0 grooved copper
Type of Collector.....	Trolley Wheel
Type of Hanger.....	Detroit Clamp

Remarks: Two phases of this three-phase system are used as trolley circuits, the third phase being connected to the rails. For single track a bracket type of construction is used and for multiple tracks, cross catenary.

Double insulation throughout is a feature of this electrification and is accomplished by means of porcelain strain insulators in series with wood strains.

All overhead fittings in the tunnel proper are of bronze.

O-B Catenary Material in Service



Maryland Electric Railways Co., Annapolis, Md.

O-B Catenary Material in Service

Maryland Electric Railways Co.

Annapolis, Md.

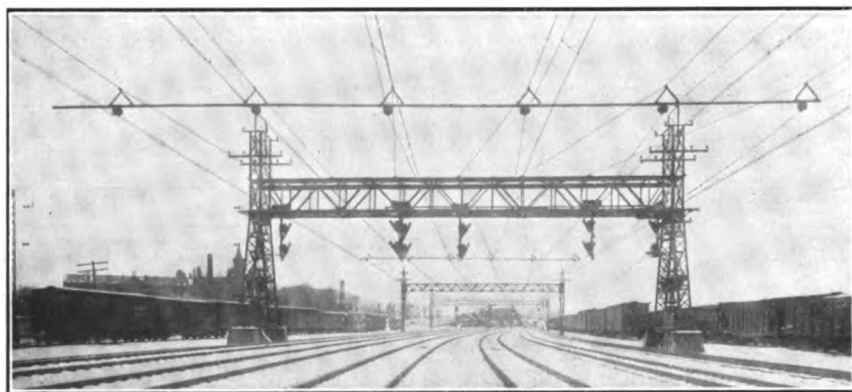
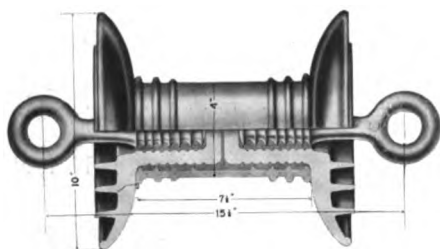
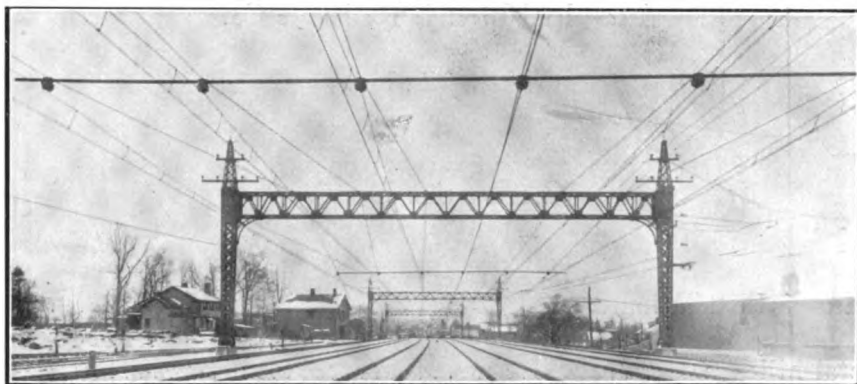
Construction Details

Date of Installation.....	1913
Total Mileage.....	32
Trolley Voltage.....	1,200 D. C.
Type of Construction.....	Wood poles and T-bar brackets
Pole Spacing on Tangents.....	120 feet
Hanger Spacing.....	15 feet
Size of Messenger Strand.....	7-16 inch steel
Size of Trolley Wire.....	3-0 grooved copper
Type of Collector.....	Pantograph
Type of Hanger.....	Flexible, with Duplex Screw Clamp

Remarks: A 4-0 grooved steel contact wire is suspended immediately below the regular copper trolley wire as shown in the illustration on the opposite page.

A special form of hanger is used, the clamp supporting both the steel and the copper wires.

O-B Catenary Material in Service



New York, New Haven & Hartford R. R., Stamford, Conn.

O-B Catenary Material in Service

New York, New Haven & Hartford R. R.

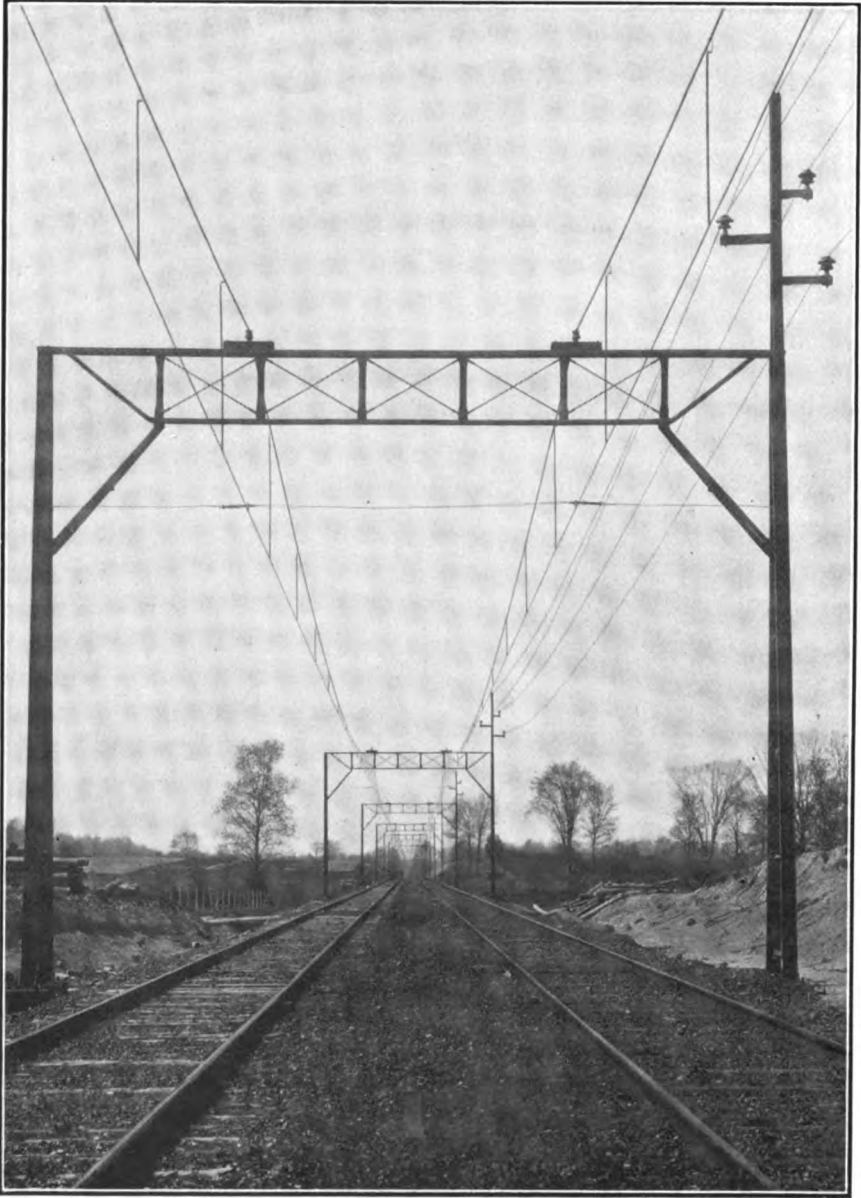
Stamford, Conn.

Construction Details

Date of Installation.....	1911-1912
Total Mileage Electrified.....	70
Trolley Voltage.....	11,000 A. C. Single Phase
Type of Construction.....	Steel bridges
Spacing on Tangents.....	300 feet
Hanger Spacing.....	10 feet
Size of Messenger Strand.....	$\frac{5}{8}$ inch steel
Size of Trolley Wire.....	4-0 grooved steel
Type of Collector.....	Pantograph
Type of Hanger.....	Rigid, with two-screw Detroit Clamp

Remarks: The extra heavy construction used on this installation made it necessary to use specially designed porcelain insulators to carry the high mechanical and electrical stresses. The two designs most used are shown on the opposite page.

O-B Catenary Material in Service



Northern Ohio Traction Co., Northfield Cut-Off, Akron, Ohio

O-B Catenary Material in Service

Northern Ohio Traction Company

Northfield Cut-off—Akron, Ohio

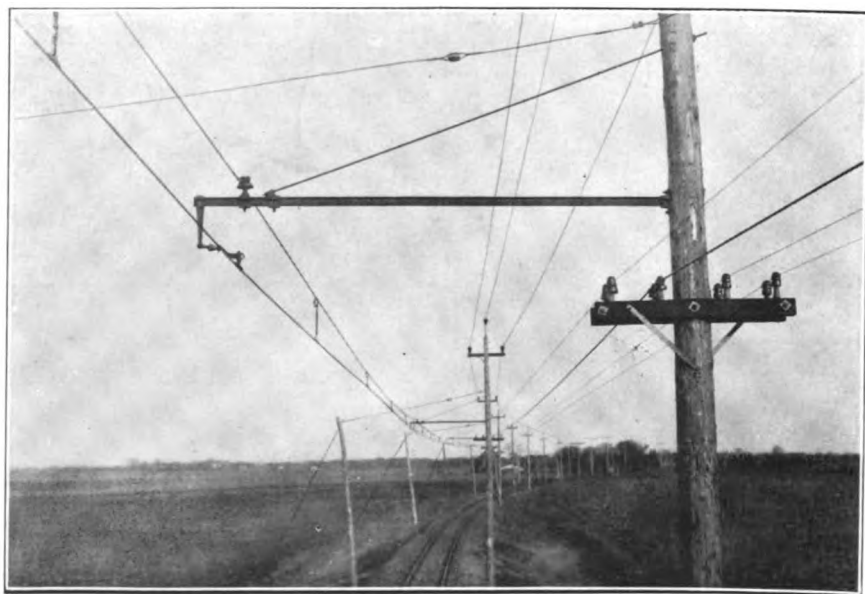
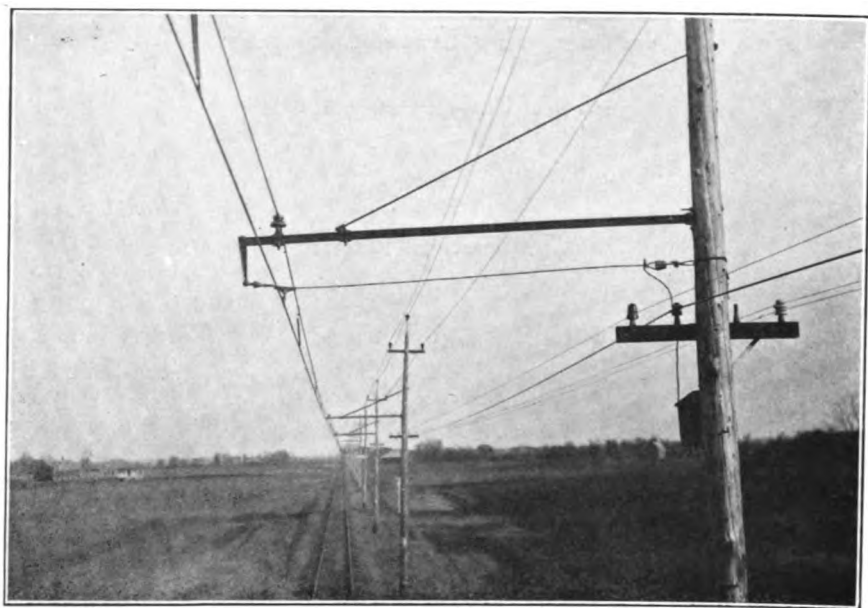
Construction Details

Date of Installation.....	1913
Total Mileage.....	*230
Trolley Voltage.....	500 D. C.
Type of Construction.....	Steel bridges
Spacing on Tangents.....	300 feet
Hanger Spacing.....	25 feet
Size of Messenger Strand.....	500,000 C. M. copper
Size of Trolley Wire.....	4-0 grooved copper
Type of Collector.....	Trolley Wheel
Type of Hanger.....	Flexible, with extruded ear

*Remarks: Above data refers particularly to the new double track Northfield cut-off which is $7\frac{1}{2}$ miles in length.

Copper messenger wire acts as feeder wire and this practice is growing in favor as the elimination of the ordinary steel messenger means a considerable saving.

O-B Catenary Material in Service



Waterloo, Cedar Falls & Northern Ry. Co., La Porte Extension, Waterloo, Iowa

O-B Catenary Material in Service

Waterloo, Cedar Falls & Northern Ry. Co.

La Porte Extension—Waterloo, Iowa

Construction Details

Date of Installation.....	1912
Total Mileage.....	.89
Trolley Voltage.....	650 D. C.
Type of Construction.....	Wood poles and T-bar brackets
Pole Spacing on Tangents.....	150 feet
Hanger Spacing.....	15 feet
Size of Messenger Strand.....	7-16 inch steel
Size of Trolley Wire.....	4-0 grooved copper
Type of Collector.....	Trolley Wheel
Type of Hanger.....	Flexible, with extruded ear

Remarks: Above data has particular reference to recent 22-mile La Porte Extension. Line is carried on 40-foot Michigan cedar poles, 7-inch tops. Transmission is three phase, 44,000 volts. 4-0 copper feeder is tapped into trolley wire at every seventh pole.

End of bracket is equipped with End Guide Casting, shown on page 69, providing a flexible pull-off or steady on curves.

O-B Catenary Material

CATENARY construction in its simplest form consists of a messenger wire supported by bracket arms or cross span wires. From this messenger wire the trolley wire is suspended by means of hangers which are spaced sufficiently close together to eliminate practically all sag in the trolley wire. Short hangers are used in center of the spans, with lengths increasing toward the support points to compensate for the sag in the messenger wire, thus maintaining the trolley wire in a horizontal position.

Various modifications of the above construction are used to meet particular requirements. The most common construction consists of a *steel* messenger wire with copper feeder wires strung in the usual manner, but some prefer to omit the steel messenger wire, using the copper feeder for supporting the trolley wire.

The trolley wire is usually copper but where a copper feeder wire serves as the messenger, a steel trolley is sometimes used because of its longer life and the smaller expense of replacement. In some instances a steel contact wire is hung a few inches below the copper trolley wire to take the wear.

Owing to the comparative ease of insulating Catenary construction, it is almost universally used on high voltage D.C. and single phase A.C. installations. However, this type of installation has great advantage in permanency and in smooth under-run, so that it has become quite popular for high speed direct current installations even where the voltage does not exceed 500.

Direct suspension limits the pole spacing to from 100 feet to 110 feet, while with Catenary construction the messenger wire carrying the load permits greatly increased pole spacing, as this spacing is limited by the strength of the poles and, to a certain extent, by the sag allowable in the messenger. Spacings of 150 feet are successfully used, the poles being wood, and of but slightly greater strength and height than good construction for direct suspension demands.

By the use of cross spans or bridges properly designed to support the loads, the span lengths can be increased to as much as 300 feet. Actual

O-B Catenary Material—*Continued*

installations have shown that single messenger construction gives perfect operation with spans of this length.

The materials offered on the following pages are the result of careful study and experiment covering a long period of time. Most of the devices have been in use under actual operating conditions on various roads for a number of years, and all the designs here recommended have passed the experimental stage.

A careful study of our designs will show that the entire line comprises only practical devices. Every article has been designed with a view to convenience of installation and adjustment, and in no case has strength been sacrificed. While we have attempted to list practically everything necessary for this type of construction, local conditions may demand certain special devices and we hold ourselves in readiness to meet these requirements.

On page 38 we give a specification form to be used when asking for recommendations or quotations, and we request that the answers be given in as full detail as possible. The services of our Engineering Department are at the disposal of those desiring information on this type of construction.

Hints on General Construction

The construction of a Catenary Trolley Line presents a number of conditions not met with in direct suspension, because of the necessity of maintaining two wires in proper relation to one another and to the track center, and at the same time leaving ample clearance for the current-collecting device at all points. In this class of construction the tendency is to work both trolley and messenger under heavy tensions, which in turn place heavy loads at all guy and anchor points. The poles, too, carry additional loads so that guys should be freely used, particularly at curves.

The Messenger Wire should not be secured rigidly at each bracket because the tension in this cable should be kept uniform throughout the line to avoid the necessity of frequently "tuning up."

O-B Catenary Material—*Continued*

Temperature Effects

Provision should be made for adjusting the tension of both the trolley and the messenger wires to allow for the difference in temperature at different seasons. This provision should be made at anchor points.

The attachment of the bracket arm to the pole should be such as to permit the end of the arm carrying the insulator to travel with the line a few inches either side of the normal position, so that in adjusting the line tension it will not be necessary to alter the adjustment of any of the trolley hangers.

Guys

All poles on curves should be strongly guyed because of the additional load placed upon them with this construction. The use of insulators in all guy wires is strongly recommended and where the guy lines are run so close to the ground that persons could come in contact with them, the lower end should be carefully grounded.

Insulation

For all voltages in excess of 6,600 we recommend the use of Porcelain Insulation, but we are prepared to supply suitable wood insulating devices for use on the higher voltages, when desired.

Extreme care should be used in the insulation of the higher voltage trolley systems because of the proximity of the transmission wires to low voltage lines used for telephones and other similar classes of service. Another point to be borne in mind is that one side of the high tension trolley circuit is grounded so that there is full line potential between the ground and trolley wire at all times.

Porcelain used for this class of service is subject to much greater abuse than on ordinary transmission lines. It is therefore imperative that the Porcelain be of the best obtainable grade not only electrically but mechanically, and any Catenary Trolley Device using Porcelain should be so designed as to reduce the mechanical abuses to a minimum. This feature has been closely watched in the design of the various articles listed in this catalogue.

O-B Catenary Material—Continued

Messengers and Guys

Ordinary Galvanized Steel Strand should not be used for the Messenger, as this material has not proper strength, and is not sufficiently uniform. Either of the following grades of strand may be used: Siemens-Martin Steel Strand or High Strength (Crucible) Steel Strand. Extra Galvanized should always be specified.

Ordinarily a $\frac{7}{16}$ -inch, seven strand Extra Galvanized Siemens-Martin Cable will meet the requirements, but where long spans are used and the messenger is subjected to extreme tension, the High Strength Strand is recommended. See data and listing of steel strand in this catalogue.

For guy strand, $\frac{1}{4}$ -inch ordinary or Siemens-Martin is sufficiently heavy for practically all pull-offs, but for heavy guys and anchors a $\frac{3}{8}$ -inch strand should be used.

Hangers and Hanger Spacings

The Hanger is a very important device in Catenary construction, and extreme care should be used in its selection. It should be simple, capable of quick application and absolutely locking so as to prevent accidental disengagement at either end.

The best results are secured where "hard spots" in the trolley wire are entirely eliminated and for this reason a Hanger permitting vertical movement of the trolley wire is preferred. This allows the trolley wire to "float" on the trolley wheel or current collector, eliminating pounding and excessive wear.

The Hangers should be spaced close enough together to hang the trolley in practically a straight line. This is more important where sliding contacts are used than with wheel operation, for with either method of current collection the collecting device must travel slightly in a vertical plane at each Hanger in order to keep contact with the wire, and the inertia of the moving parts of a sliding collector being greater, a smoother under-run is required than that for the wheel trolley.

On pages 27 and 28 are shown Hanger spacings and lengths for various span lengths. The 15-foot spacing is best for sliding current collector but the 30-foot spacing gives satisfactory results for wheel operation.

O-B Catenary Material—Continued

Curve Construction

With Curves of less than ten degrees, it is advisable to space the poles sufficiently close together to make the trolley and messenger conform to the curvature of the track by guying only at the brackets. The data on pages 30 and 31 gives the proper spacing for the poles and has been worked out so that the trolley wire can be made to hang not farther than eight inches from the track center line at either side. (See Fig. 3, page 31.)

If the curvature is sharper than ten degrees it will generally be found advisable to use longer pole spacings and to maintain the curvature of the overhead by means of bridles or pull-offs attached to hangers at different points along the span. The expense for this work would be offset by the additional expense for extra poles, pole setting, brackets, etc., if the Curves were being maintained by closer pole setting and guying at the brackets only.

Where the line is to be guyed at the poles only, install a steady strain at each bracket on the Curve. These steady arms can be used regardless of whether the pole is set on the inside or the outside of the Curve.

In erecting the Overhead on curves, sufficient clearance must be provided for the passage of a sliding current collector, if used. The elevation of the outer rail on the curve gives the car a corresponding elevation, tending to bring one end of the bow or pantograph collector considerably above the plane of the trolley wire, and this clearance should be carefully checked, if severe Curve conditions exist, to make sure that there will be no interference with the contact device. As a general thing an elevation of six inches above the trolley wire at a distance of three feet from the wire on either side will provide ample clearance, and nothing should be permitted to hang below a line joining a point so located, and a point two inches above the trolley and directly over it.

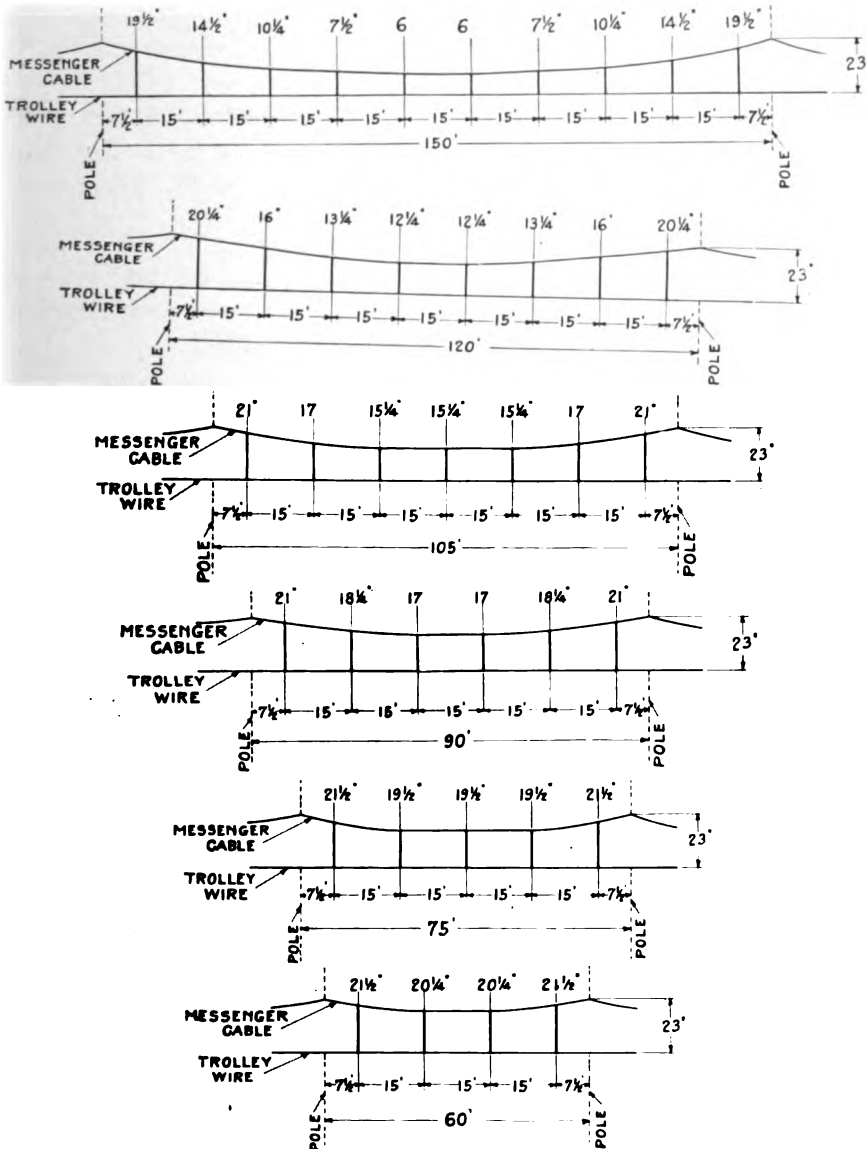
The construction on curves will, of course, be governed to a considerable extent by local conditions, and various combinations of Standard materials to meet practically any Curve requirements will readily suggest themselves.

O-B Catenary Material—Continued

Hanger lengths given below are for 150-foot pole spacing on tangents and proper shorter spacings necessary on curves.

Hangers Spaced 15 Feet

Note—Hanger lengths for other tangents with their curve spacings will be given on request.

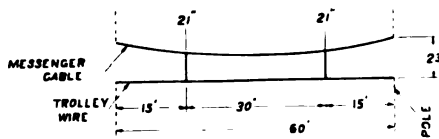
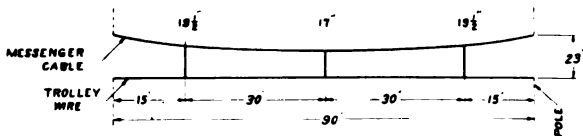
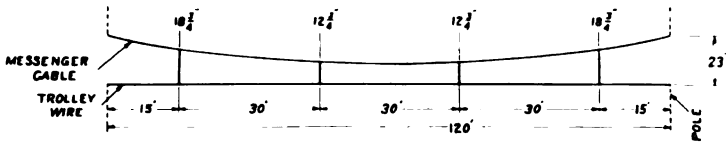
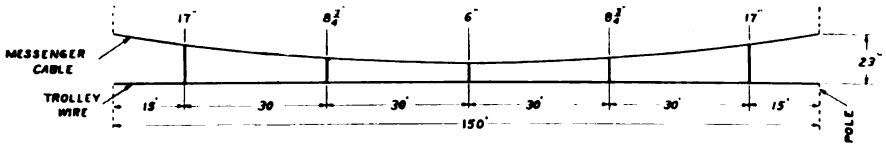


O-B Catenary Material—Continued

Hanger lengths given below are for 150-foot pole spacing on tangents and proper shorter spacings necessary on curves.

Hangers Spaced 30 Feet

Note—Hanger lengths for other tangents with their curve spacings will be given on request



O-B Catenary Material—Continued

Single Track Bracket Construction on Curves

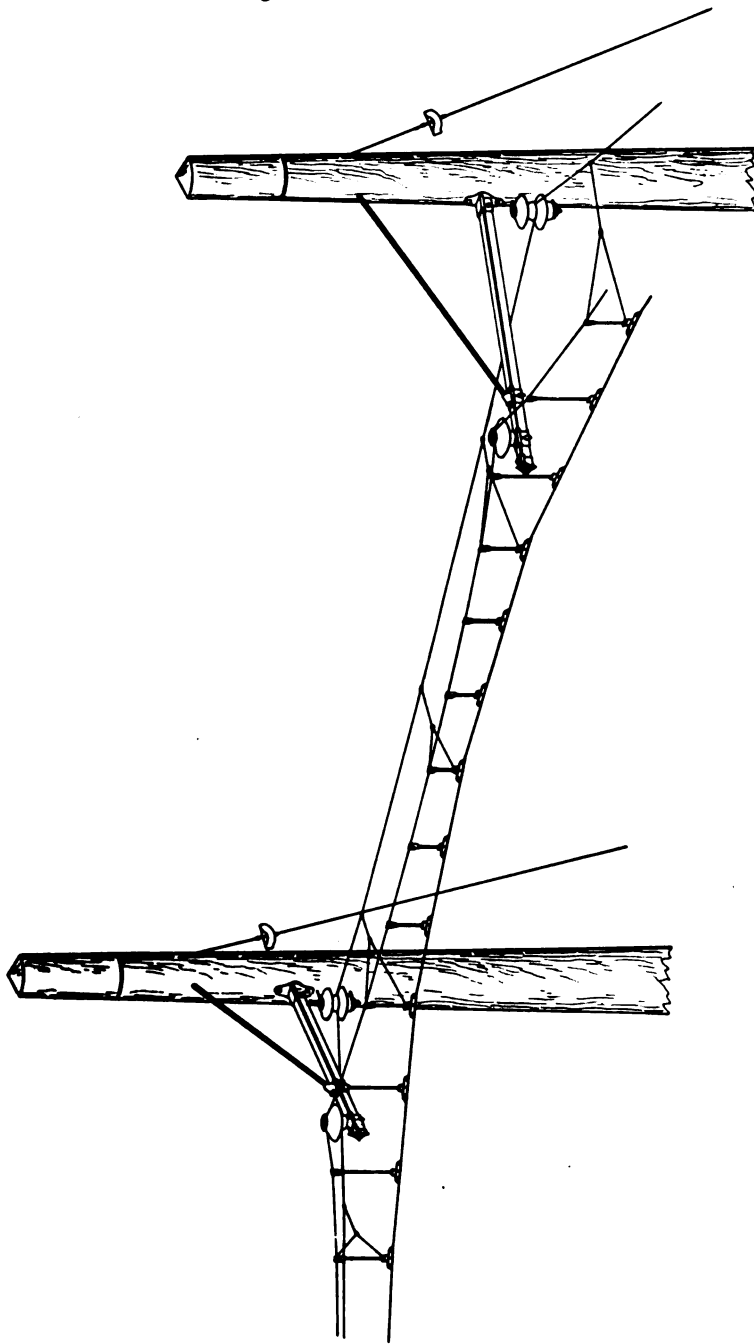


Fig. 1. Pull-Offs located between poles

O-B Catenary Material—Continued

Pole Spacing on Curves

THE following table gives the maximum curvature with which the pole spacing in the last column can be used where the wires are pulled off only at the brackets. Sixteen inches displacement of the trolley wire from the center line of the track is allowed for in the tabulated values, the trolley being pulled to the track center line of each pole as in Fig. (2).

These tabulated values are obtained from the following formula and this formula covers the arrangement shown in Fig. (2).

$$R = \frac{4 D^2 + S^2}{8D}$$

Where: $\left\{ \begin{array}{l} R = \text{Radius of Curve in feet.} \\ S = \text{Length of Span in feet.} \\ D = \text{Deflection from center line} \\ \quad \text{in feet.} \end{array} \right.$

By pulling the trolley off to a point beyond the track center, as shown in Fig. (3), the deflection from the track center line can be cut to one-half that of the arrangement in Fig. (2) for the same pole spacing. The total deflection from the true curve will of course be the same. The arrangement in Fig. (3) is preferred, particularly for wheel trolley operation. A further refinement can be obtained by setting the trolley off center far enough to correct for the displacement of the Collector, due to the elevation of the outer rail on curves.

Radius of Curve	Degree of Curve	Pole Spacing
2100 ft.	2° 30'	150 ft.
1350 "	4° 30'	120 "
1030 "	5° 30'	105 "
940 "	6° 00'	100 "
760 "	7° 30'	90 "
600 "	9° 00'	80 "
530 "	10° 00'	75 "
340 "	16° 00'	60 "

NOTE.—These values are only approximate but are sufficiently accurate for all practical purposes.

The degree of a curve can be determined approximately by laying off a chord 61', 4" long on the inside rail and measuring the distance from the chord to the rail at the middle point. This distance *in inches* is a direct

O-B Catenary Material—Continued

Pole Spacing on Curves—Continued

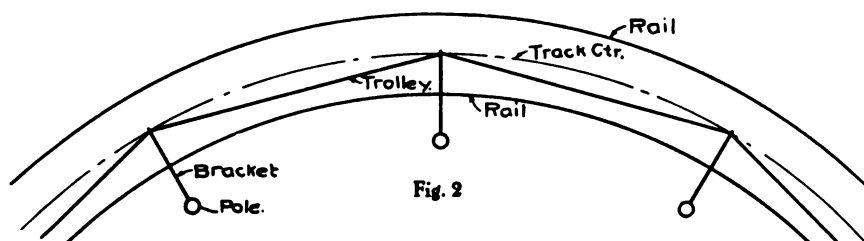


Fig. 2

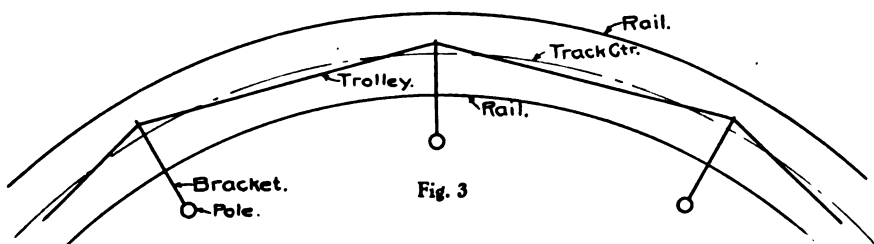


Fig. 3

expression for the *degree* of the curve. Several readings should be made at different points to eliminate errors.

Knowing either the radius or the degree of a curve, the other value may be found from one of these expressions, in which R is the radius of the curve and Δ is the degree.

$$R = \frac{50}{\text{Sine } \frac{\Delta}{2}}; \quad \text{Sine } \frac{\Delta}{2} = \frac{50}{R}$$

A simple rule for determining the radius of a curve when the degree is known is to divide the constant 5740 by the degree of the curve, expressing the minutes and seconds as a decimal fraction.

Example: What is the radius of a $2^{\circ}30'$ curve.

$$= \frac{5740}{2.5} = 2296'$$

These values are not absolute, but on curves of less than 30° are sufficiently close for all purposes in connection with the Overhead construction.

O-B Catenary Material—*Continued*

Sag in Spans

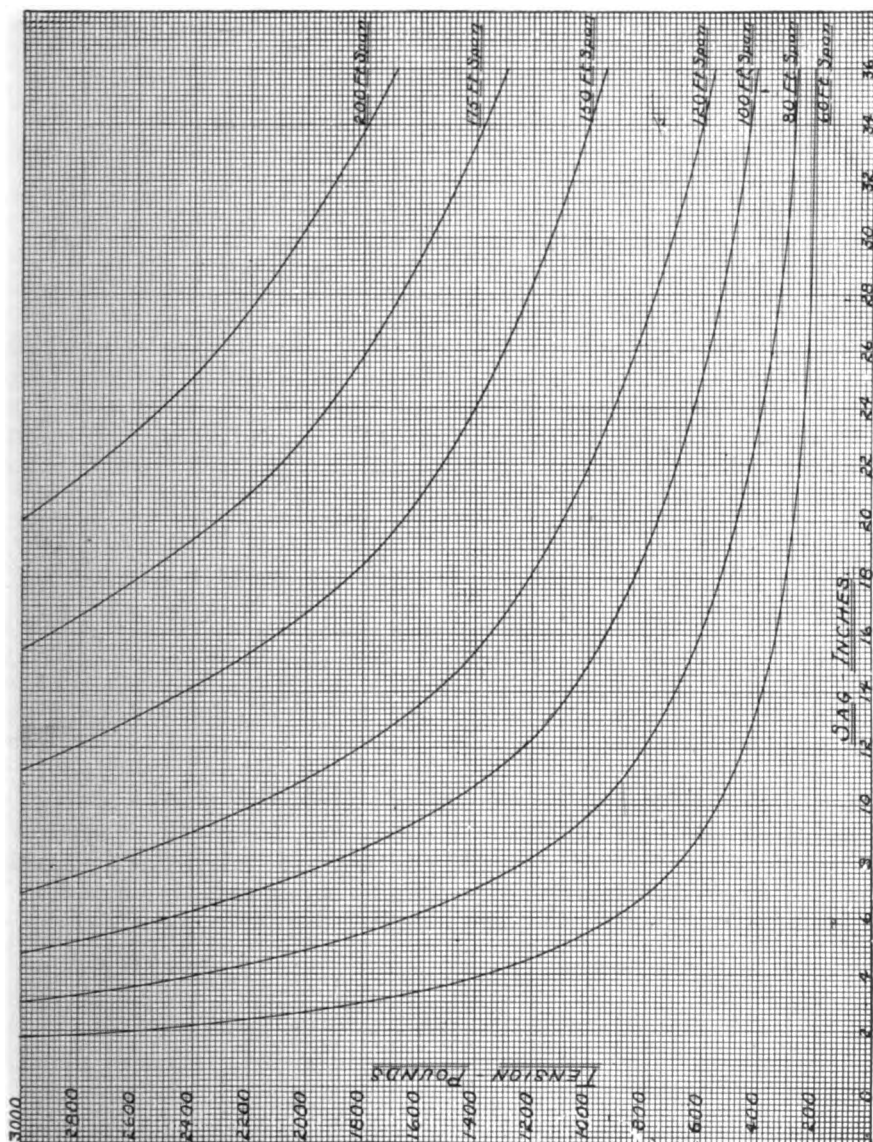
THE curves in the chart on the opposite page showing the relation between sag and tension in spans of various lengths, while general, are intended to apply particularly to catenary construction. They are based on the formula $T = \frac{S^2 W}{8d}$, where "T" equals total tension in pounds, "S" the span in ft., "W" the weight in pounds per foot and "d" the deflection or sag in feet. The weight per foot is taken at one pound which is very nearly the total weight per foot of catenary construction with $\frac{1}{4}$ " steel messenger 4-0 trolley and O. B. Co. suspensions spaced 10 ft. apart. The tensions and sags, however, for other weights per foot may be found by simply multiplying the values obtained from the curves by the weight per foot in question. The spans given, up to 150 ft., are adopted as standard very generally, the 150 ft. and 120 ft. for straight line construction and the shorter spans for curve construction.

The tensions and sags given by the above curves obviously hold true only at the time when the line is erected, as the effect of temperature is not considered in the formula. A rise in temperature tends to increase the sag and decrease the tension, while a fall in temperature has the reverse effect. The elasticity of the wire, however, allows it to elongate somewhat under any tension that results from a fall in temperature. Mathematical expressions which take into account temperature changes and the elasticity of the steel cable, are more or less complex, and it is found from practical experience in catenary trolley construction, that the tension and sag in the messenger does not as a usual thing check closely with calculated results. The effect of temperature changes upon the sag is found to be much less than the calculation would indicate.

The accumulation of sleet or snow upon the overhead construction adds considerably to its weight and consequently to the tension in the supporting messenger. In order to insure against accidents, it is therefore necessary to so adjust the tension of the wire when the line is erected that under ordinary circumstances no future stress will be sufficient to exceed the elastic limit of the material in the cable.

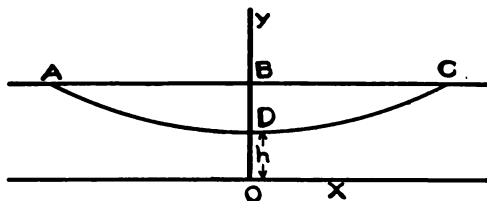
O-B Catenary Material—Continued

Tension Corresponding to Various Deflections at the Center of the Span



O-B Catenary Material—Continued

Useful Formulas Pertaining to the Catenary



- T = Total tension in the wire in pounds.
 W = Load per linear foot including weight of wire.
 S = Span length in feet (= A C).
 d = Deflection or sag at center of span in feet (= B D).
 L = Actual length of wire in feet.

The catenary may be referred to two rectangular coördinates, of which the "y" axis passes through the lowest point of the curve "D" while the "x" axis is located a distance "h" below the point "D". If the total tension in the wire at this point be represented by "T," and the weight per unit length by "W",

$$h = \frac{T}{W} \dots\dots\dots 1$$

The general equation of the catenary under these conditions is

$$y = \frac{h}{2} \left(e^{\frac{x}{h}} + e^{-\frac{x}{h}} \right) \dots\dots 2$$

(Where "e" = the base of the Napierian system of Logarithms.) but because "T" is usually so large in respect to "W", the simpler expression

$$y = h + \frac{x^2}{2h} \dots\dots\dots 3$$

applies in general practice.

Having values for "W" and "T," "h" can be found so that the actual deflection at any point on the curve can be determined.

The following formulas are also useful:

$$T = \frac{S^2 W}{8d} \dots\dots\dots 4$$

$$d = \frac{S^2 W}{8T} \dots\dots\dots 5$$

$$L = S + \frac{8d^2}{3S} \dots\dots\dots 6$$

O-B Catenary Material—Continued

Materials Required per Mile

Cross Span Construction

Single Track Tangent

Item No.	Quantity required for 150' Pole Spacing, 15' Spacing between Hangers.	Quantity required for 150' Pole Spacing, 30' Spacing between Hangers.	List of Material
1	72	72	..... Pole Strain Insulators.
2	72	72	..... Insulators for Double Insulation.
3	36	36	..... Cross Span Messenger Hangers.
4	5	5	..... Cross Span Trolley Steadies.
5	2	2	..... Trolley Wire Connectors.
6	72	36	..... 6-inch Catenary Hangers.
7	72	..	..... 7½ " " "
8	..	72	..... 8½ " " "
9	72	..	..... 10½ " " "
10	72	..	..... 14½ " " "
11	..	72	..... 17 " " "
12	72	..	..... 19½ " " "
13	72	72	..... 3 Bolt Guy Wire Clamps, Galvanized, Catalogue No. 3206.
14	82	82	..... ½-inch Wire Rope Clips, Galvanized, Catalogue No. 10268.
15	72	72	..... Steel Wire Strand Thimbles, Catalogue No. 4220.
16	1 mile	1 mile	..... American Standard Grooved Trolley Wire.
17	1 mile	1 mile	..... Messenger Cable.
18	2 sets	2 sets	..... Line Anchor Material. (See page 36.)

Double Track Tangent

THE same items will be required that are specified in Materials per mile for Single Track Cross Span Construction, given above, with the following quantity changes:

Double quantities on items Nos. 3 to 12 inclusive, 16, 17 and 18. The quantities for the other items remain the same as for single track.

O-B Catenary Material—Continued

Materials Required per Mile

Pole Bracket Construction

Single Track Tangent

Item No.	Quantity required for 150' Pole Spacing, 15' Spacing between Hangers.	Quantity required for 150' Pole Spacing, 30' Spacing between Hangers.	List of Material
1	36	36	Pole Brackets.
2	72	72	$\frac{1}{2}$ x5-inch Lag Screws.
3	36	36	Messenger Insulator Pins.
4	36	36	Messenger Insulators.
5	5	5	Steady Strains.
6	2	2	Trolley Wire Connectors.
7	72	36	6 -inch Catenary Hangers.
8	72	..	7 $\frac{1}{2}$ -inch Catenary Hanger.
9	..	72	8 $\frac{1}{2}$ " " "
10	72	..	10 $\frac{1}{2}$ " " "
11	72	..	14 $\frac{1}{2}$ " " "
12	..	72	17 " " "
13	72	..	19 $\frac{1}{2}$ " " "
14	1 mile	1 mile	American Standard Grooved Trolley Wire.
15	1 mile	1 mile	Messenger Cable.
16	2 sets	2 sets	Line Anchor Material. (See list on this page.)

Center Pole Bracket Construction

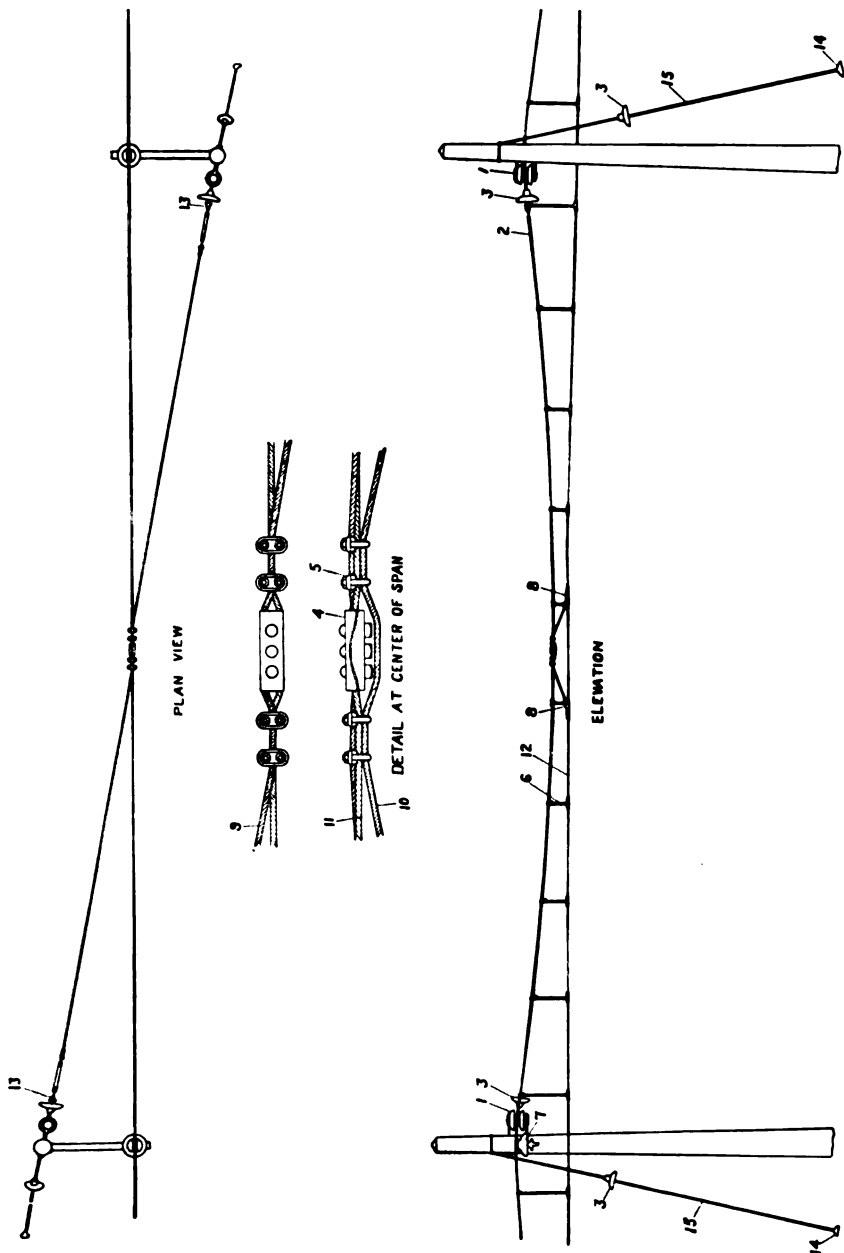
Double Track Tangent

Double all quantities given for Single Track Bracket Construction as shown above.

Materials for Single Track Line Anchor

Item No. See page 37	Quantity	Material
1	2	Pole Strain Insulators.
2	2	$\frac{1}{2}$ x12-inch Turnbuckle, Galvanized, Cat. No. 7556.
3	4	Strain Insulators for Secondary and Guy Wire Insulation.
4	1	Schaper Guy Wire Clamp, Cat. No. 10716.
5	4	$\frac{1}{2}$ -inch Wire Rope Clips, Cat. No. 10269.
6	..	Catenary Hangers.
7	..	Messenger Insulator.
8	2	Anchor Hangers.
9	..	Messenger Anchor Cable.
10	..	Trolley Anchor Cable.
11	..	Messenger Cable.
12	..	Trolley Wire.
13	2	Insulator Connections.
14	2	Guy Anchors.
15	..	Guy Wire.

Catenary Line Anchor Construction



Specification Blank

For Catenary Construction

THE following information is required in order to give a preliminary estimate of the requirements for catenary construction. A specification blank, similar to the form given below, will be furnished on application.

1. Trolley Voltage.....
2. Size of Grooved Wire.....
3. Size and kind of Messenger Wire.....
 Note: We recommend the use of Siemens-Martin or High Strength Steel Strand, Extra Galvanized. Diameter $\frac{1}{4}$ inch.
4. Height of Trolley Wire above top of rail.....
5. Number of points at which Trolley and Messenger are sectioned.....
6. Maximum train speed.....
7. Wheel or Sliding Collector.....
8. Will Steam Locomotives be regularly operated over electrified Tracks?.....

Interurban Construction

Single Track Bracket Construction

9. Length of line having Single Track Bracket Construction.....
10. Distance from track center to pole face at Trolley Height.....
 Note: Allow for Pole Rake.
11. Pole Spacing.....
 Note: We recommend 150' pole spacing on tangents, and on curves pole spacing should be modified according to the degree of curvature. (See page 30.)

Single Track Cross Span Construction

12. Length of line having Single Track Span Construction.....
13. Length of Cross-Span (distance between poles).....
14. Pole Spacing.....

Double Track Bracket Construction

15. Length of line having Double Track Bracket Construction.....
16. Center or double pole line.....
17. Distance from track center to pole face at Trolley Height.....
18. Pole Spacing.....

Double Track Cross Span Construction

19. Length of line having Double Track Cross-Span Construction.....
20. Length of Cross-Span (distance between poles), and location of Track Centers..
21. Pole Spacing.....

City Construction

22. Trolley Voltage within city limits.....
23. Length of City Construction.....
24. Bracket or Span Construction.....
25. Wood or Iron Poles, and Diameter at Trolley Height.....

Curve Construction—Interurban and City

26. For each curve, give degree of curvature or radius, and the length; also state whether double or single track, and the type of construction (Brackets or Cross-Span).....

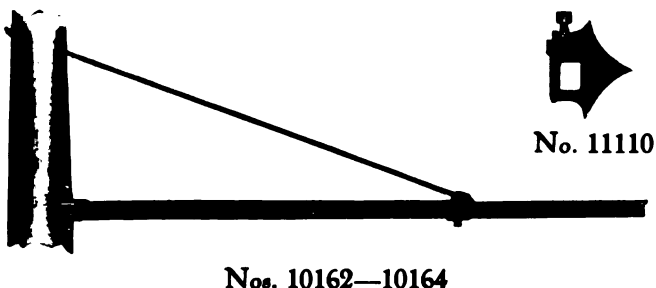
Turnouts

27. For each Turnout, give frog angle, and state length and type of construction of main line at the turnout.....

If bridge construction is used for suspending the Messenger Wire, full information should be given regarding the height and design of the bridge structure, in so far as it may affect the location of Messenger and Trolley Wires. Full information should also be given regarding Bridges or Tunnels which may affect the Overhead construction; and if possible a map or blue print showing plat of road should be furnished.

Catenary Pole Bracket

Type CE—For Wood Pole



CONSISTS of a $2\frac{1}{2} \times 2\frac{1}{4} \times \frac{1}{4}$ -inch Tee Bar Arm with a $\frac{1}{2}$ -inch rolled thread support rod. There is included a pole casting, a support rod casting and a beveled cast washer, the latter for use with the support rod at the pole.

Regularly furnished with plain end as illustrated but ornamental end casting can be included if desired.

All bracket arm castings are one piece and completely encircle Tee Bar and parts are very heavy and substantial. Support rod casting is adjustable along the arm.

Bracket can be used for practically any voltage. Messenger insulators for different voltages are listed in the High Tension Insulator section of this catalogue.

A clearance of 7 feet 6 inches from the pole face to track center is commonly used on Interurban Construction, and a 9-foot arm is long enough unless poles are given too great a rake.

Fittings malleable iron, japanned. Arms and support rods regularly furnished plain but can be japanned on special order.

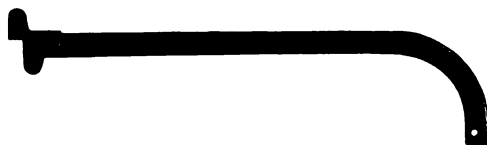
Holes in pole castings are for $\frac{1}{2} \times 5$ -inch lag screws but lags are not furnished unless specified.

Length support rod is always 6 inches less than length arm.

Code Word	No.	List Each
<i>Ionian.</i>	10162—Pole Bracket, 8-foot, 6-inch Arm	\$3 90
<i>Ionic.</i>	10163— " " 9 " Arm	4 05
<i>Ionidium.</i>	10164— " " 10 " "	4 35
<i>Ipcras.</i>	11110—Ornamental End Casting for $2\frac{1}{2} \times 2\frac{1}{4} \times \frac{1}{4}$ -inch Tee Bar	25

Catenary Extension Arm

For Tee Bar Bracket



USED in connection with the Type CE Pole Bracket listed on preceding page and provides a means for steadying trolley wire on tangents or for pull-offs on curves when poles come on inside of curve as shown in sketch on page 43.

When this construction is used, it is unnecessary to set extra poles on outside of curve for attaching strand.

A malleable iron casting is securely riveted to end of Extension and is provided with bolts for clamping it to bracket arm.

Made of $2\frac{1}{4} \times 2\frac{1}{4} \times \frac{1}{4}$ -inch Tee Bar and has a $\frac{3}{8}$ -inch hole punched in outer end for attaching strand. All parts jappanned.

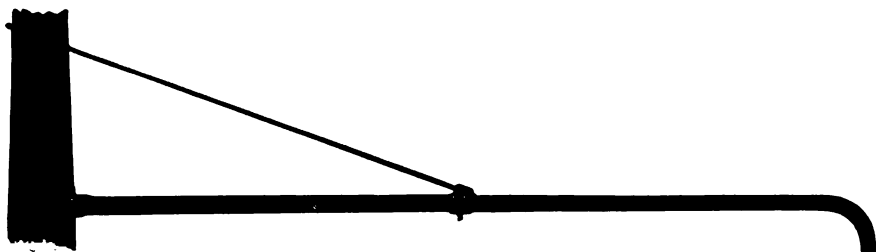
Vertical distance, top of arm to center of hole, $11\frac{1}{2}$ inches.

Code Word
Trade.

No.	List Each
11123—Extension Arm, overall length 4 feet.....	\$4 20

Catenary Pole Bracket

Type CH—For Wood Pole



SIMILAR to the Type CE Bracket except that arm is longer, curved downward at the end and provided with a $\frac{1}{8}$ -inch hole for attaching strand wire. Vertical distance, top of arm to center of hole, $11\frac{1}{2}$ inches.

May be used for steadying trolley wire on tangents or for pull-offs on curves when poles come on inside of curve as shown in sketch on page 43.

When this construction is used, it is unnecessary to set extra poles on outside of curve for attaching pull-off strand.

Consists of a $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4}$ -inch Tee Bar Arm with a $\frac{1}{8}$ -inch rolled thread support rod 8 feet, 6 inches long. There is included a pole casting, a support rod casting and a beveled cast washer, the latter for use with support rod at pole.

All bracket arm castings completely encircle Tee Bar and parts are very heavy and substantial. Support rod casting is adjustable along the arm.

Bracket can be used for practically any voltage. Messenger insulators for different voltages are listed in the High Tension Insulator section of this catalogue.

Fittings malleable iron, japanned. Arms and support rods regularly furnished plain but can be japanned on special order.

Holes in pole castings are for $\frac{1}{2} \times 5$ -inch lag screws but lags are not furnished unless specified.

Code Word

No.

List Each

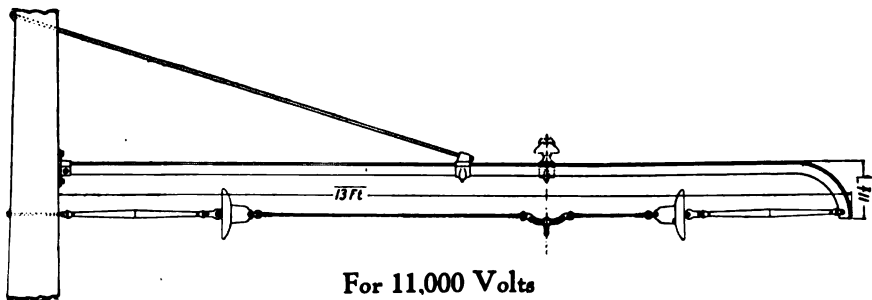
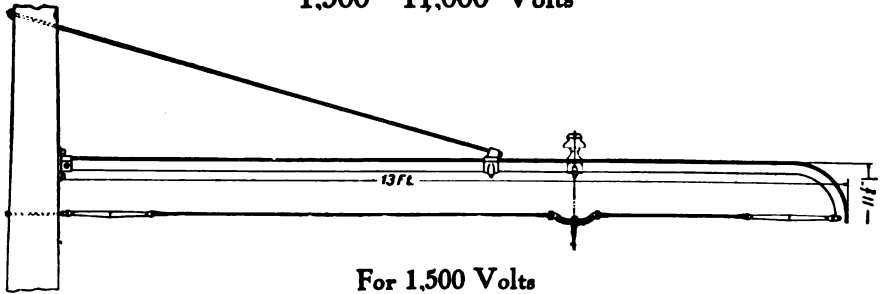
Tracund.

11122—Pole Bracket, overall length of Arm, 13-feet. \$6 00

Catenary Steady Construction

Tangent or Curve

1,500—11,000 Volts



THE scheme of construction shown above is recommended for pull-offs or steadies on tangent track or moderate curves where it is not necessary to attach pull-offs between the poles. It may be used with the Type CH Pole Bracket or the Type CE Pole Bracket equipped with the Extension Arm.

Materials Required for 1,500 Volts

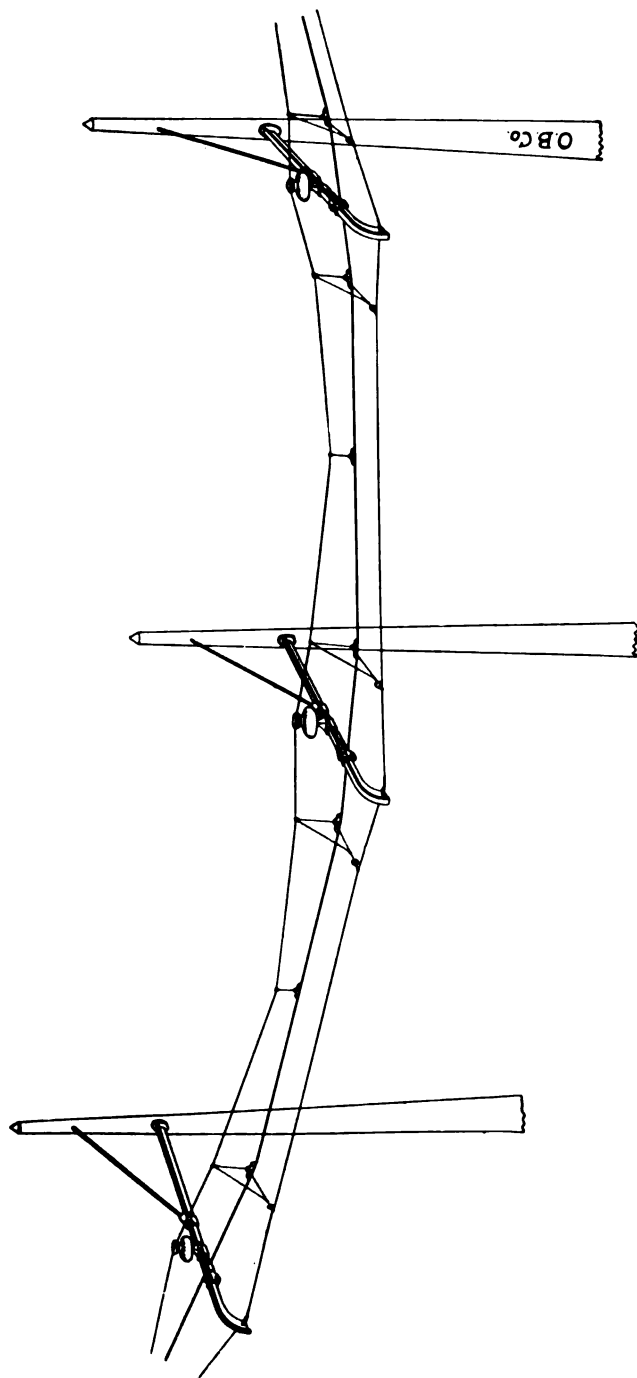
- 1 Cross Span Trolley Steady, Number 11107.
- 2 Wood Strain Insulators, $1\frac{1}{4} \times 12$ inches, Clevis Type, Number 10298.
- 12 feet $\frac{1}{4}$ -inch Galvanized Steel Strand.
- 1 Type CH Pole Bracket or—1 Type CE Pole Bracket, 9-foot Arm, Number 10163 and 1 Extension Arm, Number 11123.

Materials Required for 11,000 Volts

Add to materials given above, 2 Strain Insulators, Number 10955.

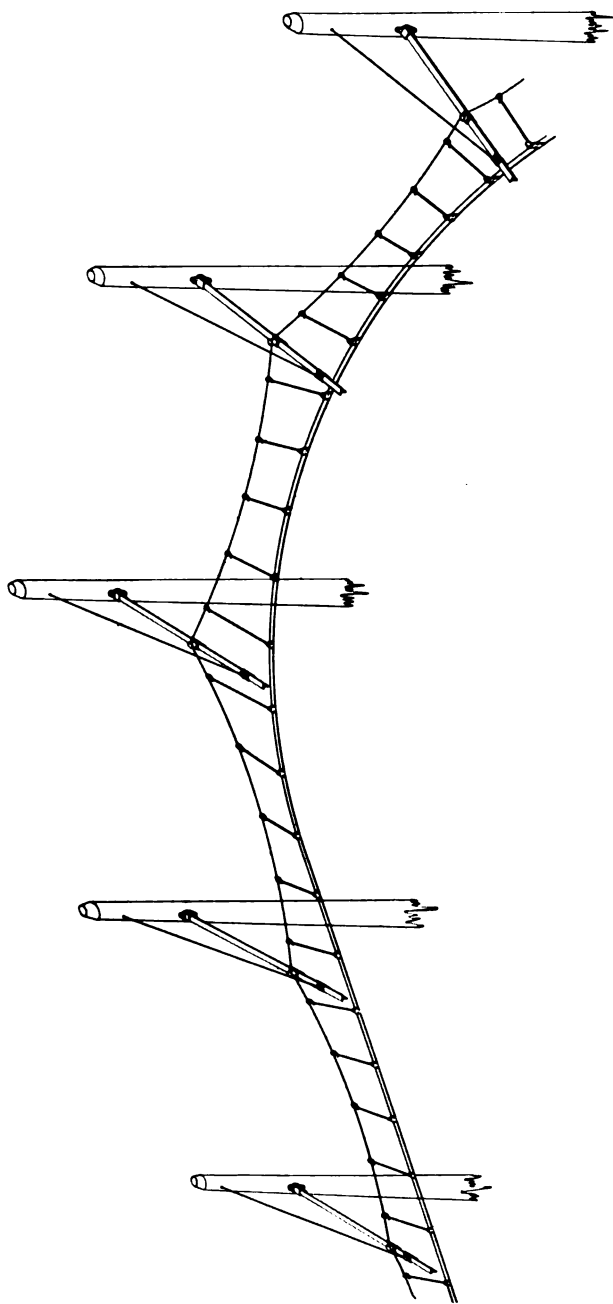
Catenary Curve Pull-Off Construction

Pull-Off Wires Between Poles



NOTE: In place of the Extension Arms, the End Guide Fitting shown on pages 68 and 69 may be used.
See pages 39 to 42 for listing of Pole Brackets

Catenary Curve Pull-off Construction



Details of this method will be furnished on request

Catenary Messenger Insulator Pin

Type CE



MADE in two sizes and used for mounting porcelain messenger insulators on the Types CE and CH Pole Brackets for Catenary Construction, insulator being cemented to Pin by purchaser at time line is erected.

Made from the best grade of malleable iron, black japanned, and will withstand any side strains that it may be subjected to under most severe curve conditions.

Base of pin completely surrounds tee bar, thus making accidental disengagements impossible. Suitable for a $2\frac{1}{2} \times 2\frac{1}{2} \times \frac{1}{4}$ -inch tee bar.

Pin No. 10168 is for use with Messenger Insulators Nos. 9937 and 10636 as listed in the High Tension Insulator section of this catalogue.

Pin No. 10644 is for use with Messenger Insulators Nos. 10640 and 9420 as listed in the High Tension Insulator section of this catalogue.

Code Word	No.	List per 100
<i>Hatted.</i>	10168—Messenger Insulator Pin, height above Tee bar $4\frac{1}{2}$ inches...	\$66 00
<i>Hatting.</i>	10644— " " " " " " " " $5\frac{1}{2}$ "	70 40

Catenary Bracket Strain Insulator

Type CA

6,600—11,000 Volts



Arranged for use on $2\frac{1}{4} \times 2\frac{1}{4} \times \frac{1}{4}$ -inch tee bracket arms.

Bracket casting is malleable iron, japanned.

Steel clevis attachment, bolts and cotter pin are sherardized.

Lead sleeve under iron collar and fibre sleeve around pin protect insulator.

Code Word	No.	List per 100
<i>Isomerism.</i>	10242—Type CA Bracket Strain Insulator, for 6,600 Volts.....	\$484 00
<i>Isometric.</i>	10243— “ “ “ “ “ “ 11,000 “	638 00

Catenary Pole Strain Insulator

Type CA—For Wood Poles

6,600—11,000 Volts



Used for attachment of strain and anchor guys and cross spans to wood poles.

Ultimate mechanical strength is approximately 12,000 pounds.

Insulators are suitable for working voltages up to 11,000 volts; furnished to order for higher voltages.

Lead sleeve under iron collar and fibre sleeve around pin protect insulator.

All metal parts are sherardized except center pin, which is jappanned.

Code Word	No.	List per 100
<i>Isomorph.</i>	10246—Type CA Pole Strain Insulator, for 6,600 Volts.....	\$550 00
<i>Isonandra.</i>	10247— “ “ “ “ “ “ 11,000 “	860 00

Type CK Catenary Hanger

Form 1—Patented



CONSISTS of two parts—extruded metal ear and sherardized steel suspension strap. Strap passes through slot in web of ear and is bent back in form of a hook and riveted.

Due to manufacturing process the extruded ear is very dense, ductile and absolutely uniform in cross section.

Makes tight fit upon trolley wire, smooth under-run and maximum clearance for wheel. Ear will fit 4-0 grooved wire, length 5 inches.

Upper part of suspension strap is formed into a closed loop $\frac{3}{4}$ inch wide by $3\frac{1}{2}$ inches long and permits vertical movement of hanger. Strap is $\frac{1}{8} \times \frac{3}{4}$ inch.

Loop is simply snapped over messenger wire and automatically springs shut so it cannot come off messenger wire. Ear can be clinched on wire before hanger is put on messenger.

Straps on all hangers 15 inches or more in length are given a twist to decrease wind resisting surface in direction that would cause swaying of trolley wire.

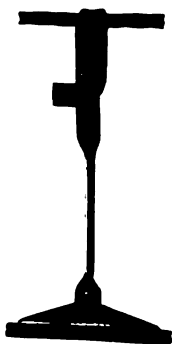
Hanger lengths given below are distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Irvingite.</i>	11141	6	\$36 30	<i>Isatogen.</i>	11150	16	\$40 50
<i>Isabel.</i>	11142	7 $\frac{1}{2}$	36 85	<i>Isatropic.</i>	11151	17	40 70
<i>Isabella.</i>	11143	8 $\frac{1}{2}$	37 40	<i>Ischiac.</i>	11152	18 $\frac{1}{2}$	41 25
<i>Isagoge.</i>	11144	10 $\frac{1}{2}$	37 95	<i>Ischiadic.</i>	11153	18 $\frac{3}{4}$	41 60
<i>Isagogic.</i>	11145	12 $\frac{1}{2}$	39 05	<i>Ischial.</i>	11154	19 $\frac{1}{2}$	41 80
<i>Isagon.</i>	11146	12 $\frac{3}{4}$	39 30	<i>Ischion.</i>	11155	20 $\frac{1}{2}$	42 00
<i>Isatinic.</i>	11147	13 $\frac{1}{2}$	39 60	<i>Ischium.</i>	11156	21	42 25
<i>Isatide.</i>	11148	14 $\frac{1}{2}$	40 00	<i>Ischury.</i>	11157	21 $\frac{1}{2}$	42 45
<i>Isatin.</i>	11149	15 $\frac{1}{2}$	40 25	.....	.....	...	.....

Above Hangers can be furnished to order for all sizes of Round, Figure 8 and Grooved Wires.

Type CK Catenary Hanger

Form 2—Patented



DIFFERS from Form 1 Hanger listed on preceding page in form of loop at upper end of strap. This Hanger should be hooked over messenger before it is attached to trolley wire.

Consists of two parts—extruded metal ear and sherardized steel suspension strap. Strap passes through slot in web of ear and is bent back in form of a hook and riveted.

Due to manufacturing process the extruded ear is very dense, ductile and absolutely uniform in cross section.

Makes tight fit upon trolley wire, smooth under-run and maximum clearance for wheel. Ear will fit 4-0 grooved wire, length 5 inches.

Upper part of suspension strap is formed into a closed loop $\frac{3}{4}$ inch wide by $3\frac{1}{4}$ inches long and permits vertical movement of hanger. Strap is $\frac{1}{8} \times \frac{3}{4}$ inch.

Straps on all hangers 15 inches or more in length are given a twist to decrease wind resisting surface in direction that would cause sway-ing of trolley wire.

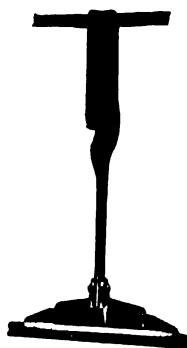
Hanger lengths given below are distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Livelode.</i>	11721	6	\$36 30	<i>Loathful.</i>	11730	16	\$40 50
<i>Livelong.</i>	11722	7 $\frac{1}{2}$	36 85	<i>Loathing.</i>	11731	17	40 70
<i>Lively.</i>	11723	8 $\frac{1}{2}$	37 40	<i>Lobated.</i>	11732	18 $\frac{1}{2}$	41 25
<i>Livered.</i>	11724	10 $\frac{1}{2}$	37 95	<i>Lobbish.</i>	11733	18 $\frac{3}{4}$	41 60
<i>Lividity.</i>	11725	12 $\frac{1}{2}$	39 05	<i>Lobbyist.</i>	11734	19 $\frac{1}{2}$	41 80
<i>Lizard.</i>	11726	12 $\frac{3}{4}$	39 30	<i>Lobcock.</i>	11735	20 $\frac{1}{2}$	42 00
<i>Loafer.</i>	11727	13 $\frac{1}{2}$	39 60	<i>Lobefoot.</i>	11736	21	42 25
<i>Loanable.</i>	11728	14 $\frac{1}{2}$	40 00	<i>Lobelua.</i>	11737	21 $\frac{1}{2}$	42 45
<i>Loathe.</i>	11729	15 $\frac{1}{2}$	40 25	.....	.....	.....	.....

Above Hangers can be furnished to order for all sizes of Round, Figure 8 and Grooved Wires.

Type CL Catenary Hanger

Form 1—Patented



CONSISTS of extruded metal ear, sherardized malleable iron casting and sherardized steel suspension strap.

Installed by clinching ear on trolley wire and snapping loop over messenger cable. Loop springs shut automatically so it cannot become accidentally disengaged from messenger cable.

Ear makes a tight fit upon trolley wire and gives maximum clearance for trolley wheel. Will fit 4-0 grooved wire. Length, 5 inches.

Strap is $\frac{1}{2} \times \frac{3}{4}$ inches and loop is $\frac{3}{4} \times 3\frac{1}{2}$ inches, allowing free vertical movement of hanger.

Straps on all hangers are given a twist to decrease wind resisting surface in direction that would cause swaying of trolley wire.

Lengths given below are distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Lobster.</i>	11473	6	\$42 35	<i>Lockup.</i>	11482	16	\$46 20
<i>Lobular.</i>	11474	7 $\frac{1}{2}$	42 90	<i>Locofoco.</i>	11483	17	46 75
<i>Localism.</i>	11475	8 $\frac{1}{2}$	43 45	<i>Lockulate.</i>	11484	18 $\frac{1}{2}$	47 30
<i>Lochage.</i>	11476	10 $\frac{1}{2}$	44 00	<i>Locusta.</i>	11485	18 $\frac{3}{4}$	47 50
<i>Lockage.</i>	11477	12 $\frac{1}{2}$	44 55	<i>Locution.</i>	11486	19 $\frac{1}{2}$	47 75
<i>Locket.</i>	11478	12 $\frac{3}{4}$	44 90	<i>Locutory.</i>	11487	20 $\frac{1}{2}$	47 95
<i>Lockjaw.</i>	11479	13 $\frac{1}{2}$	45 10	<i>Lodger.</i>	11488	21	48 20
<i>Lockman.</i>	11480	14 $\frac{1}{2}$	45 65	<i>Lodging.</i>	11489	21 $\frac{1}{2}$	48 40
<i>Lockstep.</i>	11481	15 $\frac{1}{2}$	46 00	.....	.....	...	.....

Above Hangers can be furnished to order for all sizes of Round, Figure 8 and Grooved Wires.

Type CL Catenary Hanger

Form 2—Patented



CONSISTS of extruded metal ear, sherardized malleable iron casting and sherardized steel suspension strap.

This hanger should be hooked over the messenger wire before the ear is clinched on the trolley wire.

Ear makes a tight fit upon trolley wire and gives maximum clearance for trolley wheel. Will fit 4-0 grooved wire. Length, 5 inches.

Strap is $\frac{1}{2} \times \frac{3}{4}$ inches and loop is $\frac{1}{2} \times 3\frac{1}{2}$ inches, allowing free vertical movement of hanger.

Straps on all hangers are given a twist to reduce wind resisting surface in a direction that would cause swaying of trolley wire.

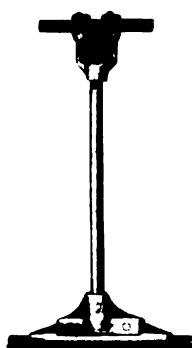
Lengths given below are distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Lodicule.</i>	11738	6	\$42 35	<i>Longan.</i>	11747	16	\$46 20
<i>Loftily.</i>	11739	7 $\frac{1}{2}$	42 90	<i>Longbow.</i>	11748	17	46 75
<i>Logged.</i>	11740	8 $\frac{1}{2}$	43 45	<i>Longhorn.</i>	11749	18 $\frac{1}{2}$	47 30
<i>Logging.</i>	11741	10 $\frac{1}{2}$	44 00	<i>Longing.</i>	11750	18 $\frac{1}{2}$	47 50
<i>Logman.</i>	11742	12 $\frac{1}{2}$	44 55	<i>Longspur.</i>	11751	19 $\frac{1}{2}$	47 75
<i>Logotype.</i>	11743	12 $\frac{3}{4}$	44 90	<i>Looming.</i>	11752	20 $\frac{1}{2}$	47 95
<i>Logwood.</i>	11744	13 $\frac{1}{2}$	45 10	<i>Loquat.</i>	11753	21	48 20
<i>Lombard.</i>	11745	14 $\frac{1}{2}$	45 65	<i>Loreal.</i>	11754	21 $\frac{1}{2}$	48 40
<i>Loment.</i>	11746	15 $\frac{1}{2}$	46 00	.....	.....	...	....

Above Hangers can be furnished to order for all sizes of Round, Figure 8 and Grooved Wires.

Type CR Catenary Hanger

Form 1—Patented



CONSISTS of extruded metal ear, two sherardized malleable iron castings and a $\frac{1}{2}$ -inch sherardized steel rod.

Screw threads of boss and rod are set up with white lead.

Permits no vertical movement of hanger on messenger wire.

Ear makes a tight fit upon trolley wire and gives maximum clearance. Will fit 4-0 grooved wire. Length of ear, 5 inches.

Installed by placing hooks of clip over messenger wire and then turning rod until upper end engages messenger. Ear is then clinched upon trolley wire.

Messenger clip takes strand up to $\frac{1}{2}$ inch in diameter.

Lengths given below are distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Loresman.</i>	11772	6	\$43 40	<i>Lucarne.</i>	11781	16	\$49 15
<i>Loricat.</i>	11773	7 $\frac{1}{2}$	44 20	<i>Lucern.</i>	11782	17	49 75
<i>Lotion.</i>	11774	8 $\frac{1}{2}$	44 90	<i>Lucifer.</i>	11783	18 $\frac{1}{2}$	50 90
<i>Loudful.</i>	11775	10 $\frac{1}{4}$	45 80	<i>Luctual.</i>	11784	18 $\frac{3}{4}$	51 25
<i>Lounger.</i>	11776	12 $\frac{1}{2}$	46 95	<i>Lugmark.</i>	11785	19 $\frac{1}{2}$	51 70
<i>Lovelock.</i>	11777	12 $\frac{3}{4}$	47 25	<i>Lullaby.</i>	11786	20 $\frac{1}{2}$	52 15
<i>Lowbell.</i>	11778	13 $\frac{1}{4}$	47 55	<i>Lumper.</i>	11787	21	52 60
<i>Loyalist.</i>	11779	14 $\frac{1}{2}$	48 30	<i>Lunarian.</i>	11788	21 $\frac{1}{2}$	52 90
<i>Lozenge.</i>	11780	15 $\frac{1}{2}$	48 80	.....	.....	...	.....

Above Hangers can be furnished to order for all sizes of Round, Figure 8 and Grooved Wires

Type CR Catenary Hanger

Form 2—Patented



CONSISTS of extruded metal ear, a sherardized malleable iron casting and a $\frac{1}{2}$ -inch sherardized steel rod.

Screw threads of boss and rod are set up with white lead.

Upper end of rod is formed into a $\frac{3}{4}$ x2-inch loop which permits vertical movement of hanger on messenger wire. Hangers are shipped with loops open for installation.

Ear makes a tight fit upon trolley wire and gives maximum clearance. Will fit 4-0 grooved wire. Length of ear, 5 inches.

Installed by clinching ear upon trolley wire and hooking loop of rod over messenger wire. Loop is then closed by a hammer blow.

Lengths given below are distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Lunette.</i>	11789	6	\$42 75	<i>Lymphoid.</i>	11798	16	\$48 55
<i>Lungfish.</i>	11790	7 $\frac{1}{2}$	43 60	<i>Lyncher.</i>	11799	17	49 10
<i>Lunifirm.</i>	11791	8 $\frac{1}{2}$	44 30	<i>Lyrical.</i>	11800	18 $\frac{1}{2}$	50 30
<i>Lupercal.</i>	11792	10 $\frac{1}{2}$	45 20	<i>Maalin.</i>	11801	18 $\frac{3}{4}$	50 60
<i>Lurdan.</i>	11793	12 $\frac{1}{2}$	46 35	<i>Mabble.</i>	11802	19 $\frac{1}{2}$	51 10
<i>Luscious.</i>	11794	12 $\frac{3}{4}$	46 65	<i>Macaco.</i>	11803	20 $\frac{1}{2}$	51 50
<i>Lusory.</i>	11795	13 $\frac{1}{2}$	46 95	<i>Macarize.</i>	11804	21	51 95
<i>Lyceum.</i>	11796	14 $\frac{1}{2}$	47 65	<i>Macaroon.</i>	11805	21 $\frac{1}{2}$	52 30
<i>Lycopodi.</i>	11797	15 $\frac{1}{2}$	48 15	.....	.....	...	.....

Above Hangers can be furnished to order for all sizes of Round, Figure 8 and Grooved Wires.

Type CM Catenary Hanger



MALLEABLE iron jaw castings are fastened to steel suspension strap by a $\frac{1}{2} \times 1\frac{1}{8}$ -inch carriage bolt passing through all three parts.

When hanger is installed, tightening of bolt causes jaws to grip trolley wire. A lock washer prevents nut from working loose.

Suspension strap is $\frac{1}{2} \times 1$ inch and has a $\frac{5}{8} \times 3$ -inch loop which allows vertical movement of hanger.

This hanger should be hooked over the messenger wire before the clamp is attached to the trolley wire.

Clamp takes 2-0, 3-0 and 4-0 grooved wire; length of jaws $2\frac{1}{2}$ inches. All parts sherardized.

Lengths given below refer to distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Macerate.</i>	11490	6	\$34 65	<i>Madbrain.</i>	11499	16	\$39 15
<i>Machete.</i>	11491	7 $\frac{1}{2}$	35 20	<i>Madcap.</i>	11500	17	39 60
<i>Macilent.</i>	11492	8 $\frac{1}{2}$	35 75	<i>Madden.</i>	11501	18 $\frac{1}{2}$	40 15
<i>Mackerel.</i>	11493	10 $\frac{1}{2}$	36 30	<i>Maddish.</i>	11502	18 $\frac{1}{2}$	40 50
<i>Mackle.</i>	11494	12 $\frac{1}{2}$	37 40	<i>Madeira.</i>	11503	19 $\frac{1}{2}$	40 70
<i>Macron.</i>	11495	12 $\frac{1}{2}$	37 60	<i>Madjoun.</i>	11504	20 $\frac{1}{2}$	40 90
<i>Macropod.</i>	11496	13 $\frac{1}{2}$	37 95	<i>Madness.</i>	11505	21	41 15
<i>Macrucan.</i>	11497	14 $\frac{1}{2}$	38 50	<i>Madonna.</i>	11506	21 $\frac{1}{2}$	41 35
<i>Macula.</i>	11498	15 $\frac{1}{2}$	38 95	.....	.....	.....	.....

Type CN Catenary Hanger

Form 1



THREE screw clamp of the Detroit type is riveted to steel suspension strap. Clamp takes 2-0, 3-0 and 4-0 grooved wire.

Strap is $\frac{1}{2} \times \frac{1}{2}$ inch and has $\frac{3}{4} \times 3\frac{1}{2}$ -inch loop, allowing vertical movement of hanger. Loop is snapped over messenger cable and automatically springs shut so that accidental disengagement is impossible. Clamp can be tightened on trolley wire before hanger is put on messenger.

Clamp offers good clearance for trolley wheel. Length, $3\frac{1}{2}$ inches.

Straps on all hangers are given a twist to decrease wind resisting surface in direction that would cause swaying of trolley wire.

All parts are sherardized.

Lengths given below refer to distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Madoqua.</i>	11507	6	\$24 75	<i>Magnate.</i>	11516	16	\$28 60
<i>Madrigal.</i>	11508	7 $\frac{1}{2}$	25 30	<i>Magnific.</i>	11517	17	29 15
<i>Madwort.</i>	11509	8 $\frac{1}{2}$	25 85	<i>Magnify.</i>	11518	18 $\frac{1}{2}$	29 70
<i>Maestro.</i>	11510	10 $\frac{1}{2}$	26 40	<i>Maiden.</i>	11519	18 $\frac{3}{4}$	29 90
<i>Maffle.</i>	11511	12 $\frac{1}{2}$	26 60	<i>Maidenly.</i>	11520	19 $\frac{1}{2}$	30 15
<i>Magdala.</i>	11512	12 $\frac{3}{4}$	26 95	<i>Mailclad.</i>	11521	20 $\frac{1}{4}$	30 40
<i>Magenta.</i>	11513	13 $\frac{1}{2}$	27 50	<i>Mainland.</i>	11522	21	30 60
<i>Magical.</i>	11514	14 $\frac{1}{2}$	28 05	<i>Mainsail.</i>	11523	21 $\frac{1}{2}$	30 80
<i>Magician.</i>	11515	15 $\frac{1}{2}$	28 40	.....	.....	...	.....

Type CN Catenary Hanger

Form 2



THREE screw clamp of the Detroit type is riveted to steel suspension strap. Clamp takes 2-0, 3-0 and 4-0 grooved wire.

Strap is $\frac{1}{8} \times \frac{3}{4}$ inch and has $\frac{3}{4} \times 3\frac{1}{2}$ -inch loop, allowing vertical movement of hanger. This hanger should be hooked over the messenger wire before the clamp is attached to the trolley wire.

Clamp offers good clearance for trolley wheel. Length, $3\frac{1}{2}$ inches.

Straps on all hangers are given a twist to decrease wind resisting surface in direction that would cause swaying of trolley wire.

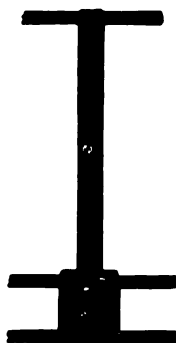
All parts are sherardized.

Lengths given below refer to distances between centers of messenger cable and trolley wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Mainyard.</i>	11755	6	\$24 75	<i>Maltese.</i>	11764	16	\$28 60
<i>Majestic.</i>	11756	7 $\frac{1}{2}$	25 30	<i>Malting.</i>	11765	17	29 15
<i>Majorat.</i>	11757	8 $\frac{1}{2}$	25 85	<i>Maltose.</i>	11766	18 $\frac{1}{2}$	29 70
<i>Malady.</i>	11758	10 $\frac{1}{2}$	26 40	<i>Mammel.</i>	11767	18 $\frac{1}{2}$	29 90
<i>Maledict.</i>	11759	12 $\frac{1}{2}$	26 60	<i>Manacle.</i>	11768	19 $\frac{1}{2}$	30 15
<i>Malkin.</i>	11760	12 $\frac{1}{2}$	26 95	<i>Manakin.</i>	11769	20 $\frac{1}{2}$	30 40
<i>Mallard.</i>	11761	13 $\frac{1}{2}$	27 50	<i>Manchel.</i>	11770	21	30 60
<i>Malleate.</i>	11762	14 $\frac{1}{2}$	28 05	<i>Manchu.</i>	11771	21 $\frac{1}{2}$	30 80
<i>Mallows.</i>	11763	15 $\frac{1}{2}$	28 40	.....	.....	...	.....

Type CP Catenary Hanger

Duplex



USED where a steel contact wire and a copper trolley wire are installed for pantograph operation.

Consists of a Duplex Clamp similar to that shown on page 58 to which is attached a double strap loop which, when hooked over the messenger wire, gives a flexible support. Strap is $\frac{1}{8} \times \frac{3}{4}$ inch.

Jaws of clamp are bolted together by a $\frac{3}{8} \times 1\frac{1}{2}$ -inch carriage bolt with hex nut. Each jaw is riveted to one end of the strap loop.

Clamp is malleable iron, sherardized. It completely encircles upper wire and provides ample clearance on lower wire.

Length of clamp, 2 inches; separation between wires $1\frac{1}{4}$ inches. Takes 3-0 copper and 4-0 steel grooved wire.

Code Word	No.	Length Inches	List per 100	Code Word	No.	Length Inches	List per 100
<i>Mandarin.</i>	11704	6	\$30 30	<i>Mansuete.</i>	11713	16	\$38 65
<i>Mandate.</i>	11705	7 $\frac{1}{2}$	31 55	<i>Mantelet.</i>	11714	17	39 50
<i>Manful.</i>	11706	8 $\frac{1}{2}$	32 60	<i>Mantilla.</i>	11715	18 $\frac{1}{2}$	40 55
<i>Mangrove.</i>	11707	10 $\frac{1}{2}$	33 85	<i>Mantissa.</i>	11716	18 $\frac{1}{2}$	40 95
<i>Manicure.</i>	11708	12 $\frac{1}{2}$	35 50	<i>Manling.</i>	11717	19 $\frac{1}{2}$	41 60
<i>Manikin.</i>	11709	12 $\frac{1}{2}$	35 95	<i>Manuary.</i>	11718	20 $\frac{1}{2}$	42 20
<i>Manito.</i>	11710	13 $\frac{1}{2}$	36 35	<i>Manumit.</i>	11719	21	42 85
<i>Mannerly.</i>	11711	14 $\frac{1}{2}$	37 40	<i>Mappery.</i>	11720	21 $\frac{1}{2}$	43 25
<i>Mansion.</i>	11712	15 $\frac{1}{2}$	38 00	.....	.....	...	.....

Above Hangers can be furnished to order for other sizes of Copper and Steel Grooved Wires.

Duplex Catenary Clamp



USED where it is desired to install two trolley wires—a steel contact wire because of its wearing qualities and a copper wire for feeder, the latter being supported from a messenger in the same manner as when single catenary construction is used.

Installed midway between regular catenary hangers, thus providing greater flexibility.

Clamp completely encircles upper wire and provides ample clearance on lower wire. Separation between wires is $1\frac{3}{4}$ inches. Length, 2 inches.

Code Word
Marabou.

No. 11036—Clamp, Malleable Iron, Sherardized, for 4-0 Grooved Wires. List per 100 \$22 00

Duplex Catenary Pull-Off Clamp



Used for attaching pull-off wires to duplex trolley. Similar to Clamp listed above, only difference being the substitution of an eye-bolt with square nut and lock washer for the two screws.

Hole for strand in eye-bolt is $\frac{9}{16}$ inch in diameter.

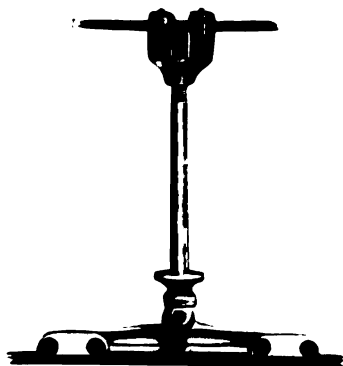
Code Word
Maranta.

No. 11037—Pull-Off Clamp, Mall. Iron, Sher., for 4-0 Grooved Wires. . . . List per 100 \$35 20

Catenary Pull-Off Hanger

Type CA—Form 1

Patented



FOR use where necessary to hold messenger cable and trolley wire in place on curves by means of pull-off wires, as such conditions require a strong, substantial hanger.

Installed by placing hooks of messenger clip over wire and turning clamp until the upper end of the rod engages messenger.

Clamp is our Detroit—Form 4, Catalogue No. 8973, malleable iron, sherardized, for 2-0, 3-0 and 4-0 grooved wire; length overall 10 inches, length of end jaws $2\frac{1}{2}$ inches.

A malleable iron collar is provided above clamp to attach pull-off wire. Threads on boss and rod are set up with white lead.

Messenger pull-off wire is attached directly to messenger cable at either side of messenger clip.

Malleable iron messenger clip will take strand up to $\frac{1}{2}$ inch in diameter.

Steel rod is $\frac{1}{2}$ inch in diameter. All parts are sherardized.

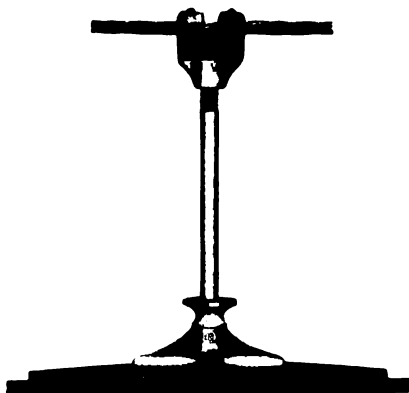
Hanger lengths given below are distances between centers of messenger cable and trolley wire.

Code Word	No.		List per 100
<i>Isiac.</i>	10220—	Pull-Off Hanger, length 6 inches.....	\$ 74 80
<i>Isicle.</i>	10221—	" " " 14 $\frac{1}{2}$ "	81 40
<i>Islam.</i>	10222—	" " " 15 $\frac{1}{2}$ "	82 50
<i>Islamism.</i>	10223—	" " " 16 "	83 60
<i>Islamite.</i>	10224—	" " " 19 $\frac{1}{2}$ "	85 80
<i>Islamitic.</i>	10225—	" " " 21 $\frac{1}{2}$ "	86 90

Catenary Pull-Off Hanger

Type CA—Form 2

Patented



FOR use where it is necessary to hold messenger cable and trolley wire in place on curves.

Trolley wire is supported by extruded ear No. 11341 which is 12 inches long and fits 4-0 grooved wire.

Malleable iron collar is provided above ear for attaching pull-off wire. Threads on boss and rod are set up with white lead.

Messenger pull-off is attached directly to messenger cable at either side of messenger clip.

Malleable iron messenger clip will take strand up to $\frac{1}{2}$ inch in diameter.

Steel rod is $\frac{5}{8}$ inch in diameter. All iron parts sherardized.

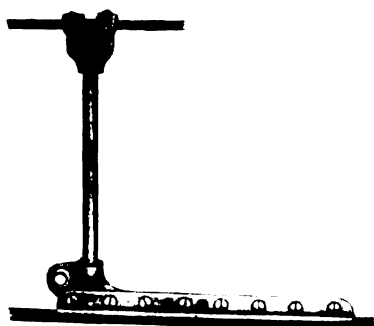
Hanger lengths given below refer to distances between centers of messenger cable and trolley wire.

Code Word	No.				List per 100
<i>Marauder.</i>	11469—	Pull-Off Hanger, length	6	inches.....	\$105 60
<i>Marbling.</i>	11470—	" " " "	14 $\frac{1}{2}$	"	110 00
<i>Marcher.</i>	11471—	" " " "	15 $\frac{1}{2}$	"	111 10
<i>Marcid.</i>	11434—	" " " "	16	"	112 20
<i>Margaric.</i>	11435—	" " " "	19 $\frac{1}{2}$	"	114 40
<i>Margay.</i>	11436—	" " " "	21 $\frac{1}{2}$	"	116 60

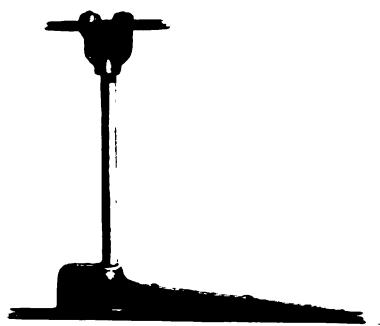
Catenary Anchor Hangers

Type CB—Forms 1 and 2

Patented



Form 1



Form 2

USED for anchoring trolley wire to messenger (see page 37 for anchor scheme).

Form 1 Anchor Hanger provided with 12-inch malleable iron clamp, sherardized, for 2-0, 3-0 and 4-0 grooved wire.

Form 2 Anchor Hanger provided with 12-inch Clinch Bronze Ear tinned for soldering, for 4-0 grooved wire.

Rod is $\frac{3}{8}$ -inch steel, sherardized; messenger clip, malleable iron, sherardized, and will fit strand up to $\frac{1}{2}$ inch in diameter.

Screw threads of boss and rod are set up with white lead.

Hanger lengths given below are distances between centers of messenger cable and trolley wire.

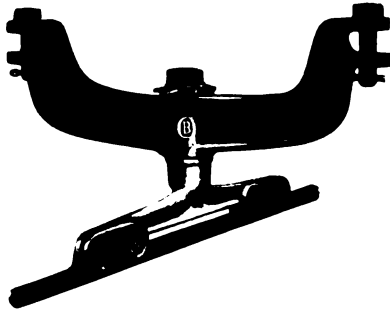
Form 1

Code Word	No.	List per 100
<i>Ismalize.</i>	10226—Anchor Hanger, Form 1, length 6 inches.....	\$ 94 60
<i>Islander.</i>	10227—“ “ “ 1 “ 10 $\frac{1}{2}$ “	100 10
<i>Islandy.</i>	10228—“ “ “ 1 “ 14 $\frac{1}{2}$ “	105 60
<i>Margent.</i>	11467—Clamp only, Mall. Iron, Sher., for 2-0 to 4-0 Grooved Wire	68 20

Form 2

<i>Isobar.</i>	10229—Anchor Hanger, Form 2, length 6 inches.....	\$143 00
<i>Isobaric.</i>	10230—“ “ “ 2 “ 10 $\frac{1}{2}$ “	147 40
<i>Isobarism.</i>	10231—“ “ “ 2 “ 14 $\frac{1}{2}$ “	151 80
<i>Margrave.</i>	11468—Ear only, Bronze, for 4-0 Grooved Wire.....	112 20

Catenary Cross Span Trolley Steady



USED for steadying trolley wire on tangents or for pull-off work on curves with cross span construction or with Type CH Catenary Pole Bracket. See Fig. 2 on page 66.

Having no connection with messenger, it eliminates hard spots in trolley.

Clamp is our Detroit—Form 4, Catalogue No. 8973, malleable iron, sherardized; length overall 10 inches, length of end jaws $2\frac{1}{2}$ inches.

Yoke malleable iron, sherardized; opening in clevis $\frac{3}{8}$ inch, clevis bolt $\frac{1}{8} \times 1\frac{1}{2}$ inches.

Code Word
Marigold.

No. 11827—Steady for 2-0, 3-0 and 4-0 Grooved Wire.....

List per 100

\$126 50

Catenary Feeder Connector

Patented



Used for attaching feeder wire to trolley wire and for attaching a bond from messenger wire to trolley wire for the purpose of equalizing the voltage between the two wires and minimizing the passage of current through catenary hangers.

Runner piece is extruded metal, 3 inches long, tinned and soldered to cast bronze boss.

Code Word
Marinade.

No. 11432—Connector for 4-0 Cable and 4-0 Grooved Trolley Wire....

List per 100

\$57 20

Catenary Cross Span Messenger Hanger

Type CA



USED to support messenger cable from cross span cable and allows cross span to be alive with respect to pole insulator.

Nuts and "U" bolts are of forged steel, body malleable iron, all parts sherardized.

This device avoids the necessity of cutting span wire.

Messenger is strung along right of way and temporarily held in place below cross span and after tension in messenger is properly adjusted, messenger and span wire are clamped together.

Diameter of groove for messenger is $\frac{1}{2}$ inch, "U" bolts take strand up to $\frac{3}{8}$ inch diameter.

Code Word

No.

List per 100

Isoclinal.

10232—Type CA Cross Span Messenger Hanger, Sherardized. \$55 00

Catenary Cross Span Messenger Hanger

Type CB



INTENDED to support messenger cable in cross span construction where desired to insulate cross span at messenger cable.

For this purpose, clevis Wood Strain Insulators should be installed on each side of messenger hanger, the messenger resting in slot on top of body casting.

Slot will take cable up to $\frac{1}{2}$ inch diameter, holes in eyes are $\frac{3}{8}$ inch diameter.

If desired to insulate only at the pole, span wire can be attached directly to eyes.

"U" bolt forged steel, body casting malleable iron, all parts sherardized.

Code Word

No.

List per 100

Isoclinic.

10233—Type CB Cross Span Messenger Hanger, Sherardized. \$55 00

Catenary Cross Span for Tangent Track

Key to Numbers Appearing in Fig. 1, page 66

Item No. in Fig. 1	Quan- tity	Material
1	2	..... Pole Strain Insulators.
2	1	..... Cross Span Messenger Hanger, Cat. No. 10232.
3	2	..... $\frac{3}{8}$ -inch Wire Rope Clips Galvanized, Cat. No. 10268.
4	2	..... 3 Bolt Guy Wire Clamps, Cat. No. 3206.
5	2	..... $\frac{3}{8}$ " Steel Wire Strand Thimbles, Cat. No. 4220.
6	..	..... Steel Strand.
7	..	..... Messenger Cable.
8	..	..... Trolley Wire.

Catenary Steady and Curve Cross Span

Key to Numbers Appearing in Fig. 2, page 66

Item No. in Fig. 2	Quan- tity	Material
1	..	..... Trolley Wire.
2	..	..... Messenger Cable.
3	1	..... Cross Span Trolley Steady, Cat. No. 11827.
4	2	..... $\frac{3}{8}$ " Wire Rope Clips, Cat. No. 10268.
6	1	..... Cross Span Messenger Hanger, Cat. No. 10232.
7	2	..... Strain Insulators for Secondary Insulation.
8	2	..... Pole Strain Insulators.

Catenary Cross Span for Tangent Track

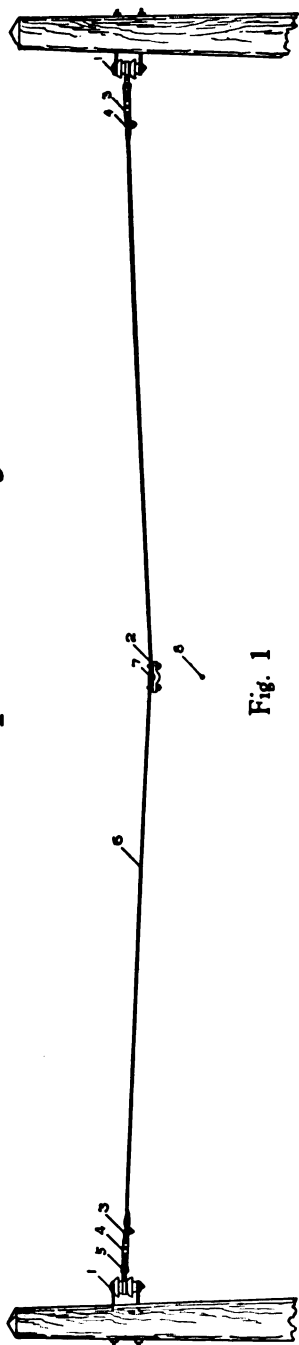


Fig. 1

Catenary Steady and Curve Cross Span

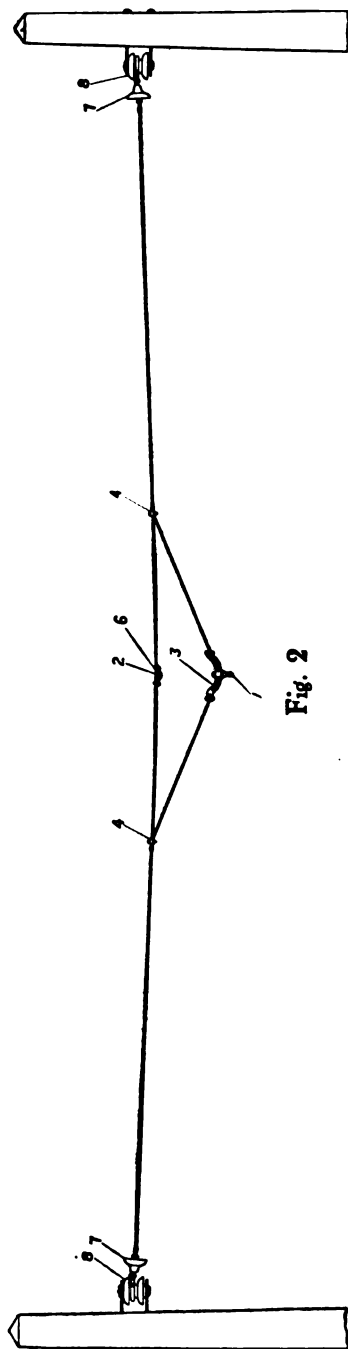


Fig. 2

See page 65 for list of materials required

Catenary Steady Strains

THE steady strain is used for maintaining the trolley wire in proper alignment on curves, for staggering it on tangents, for pantograph operation, and to steady it against swinging or horizontal displacement on tangents. On curves of ten degrees or less it is usually advantageous to space the poles close enough together to make it unnecessary to pull the trolley wire off at points between poles.

Several approved methods of steadying are illustrated on page 68. Fig. 1 shows the arrangement of the steady for tangent construction, about five steady points per mile being sufficient.

On curves, where the poles are on the inside of the curve, the method shown in Fig. 2 is used at each pole.

When the poles are outside of the curve, the arrangement is modified as shown in Fig. 3.

This scheme of construction is light and perfectly flexible, causing no "hard spots" in the trolley wire and with this arrangement almost any form of insulation may be used to fit the conditions.

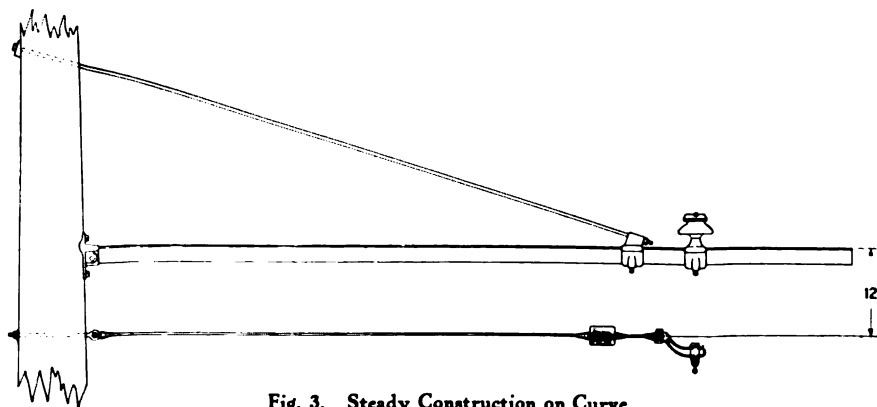
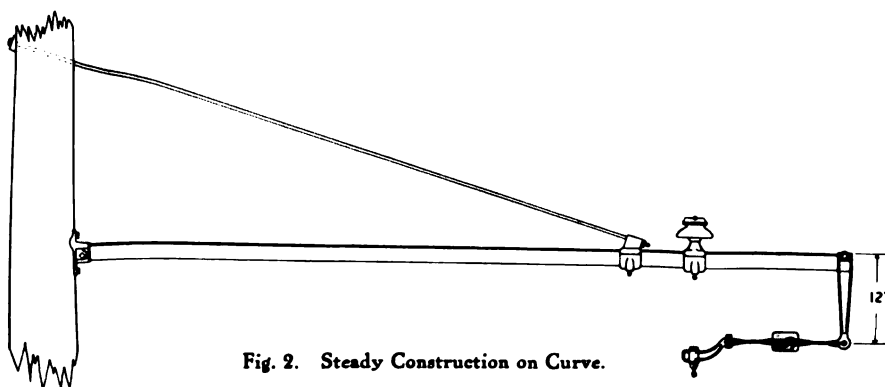
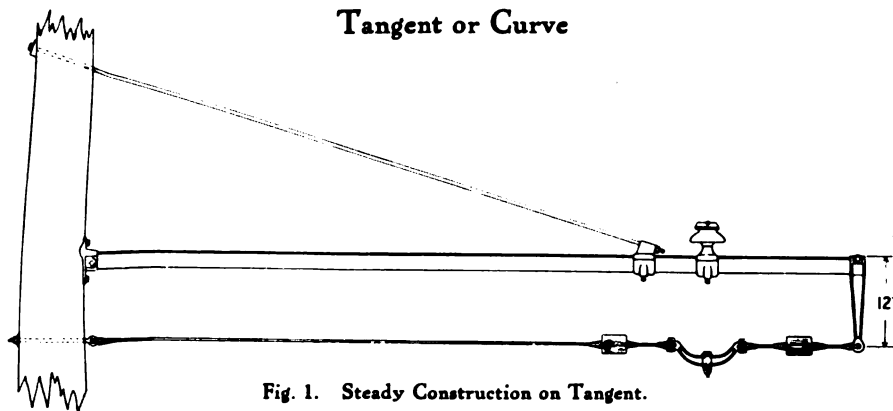
The regular Tee Bar Pole Brackets are used; Figs. 1 and 2 require the End Guide Fitting shown on page 69. The other material consists of a standard Ear, a single or double curve Pull-Over (used inverted) and suitable Strain Insulators.

A Steady Arm may be used in place of this construction if desired and popular forms suitable for both curve and tangent construction are listed on pages 70, 71 and 72.

The question of clearance between the steady arm and the plane of the trolley wire is of considerable moment where a sliding or a bow collector is to be operated. On curves, the outer rail, being elevated, causes one end of the Collector Shoe to be raised a considerable distance above the trolley wire. On tangents, also, one end of the shoe is apt to come above the plane of the trolley wire, due either to the shoe being bent, or to swinging or lurching of the car. A distance of 6 inches between the Steady Strain and the horizontal plane of the trolley wire at a point 3 feet from the trolley provides sufficient clearance for practically all conditions.

Catenary Steady Construction

Tangent or Curve



Catenary End Guide Fitting

For Tee Bar Pole Bracket



USED with Type CE Pole Bracket listed on page 39. Guide casting provides a means for steadying trolley wire on tangents or for pull-offs on curves where poles are set on inside of curve as shown on page 43.

For method of installation see Figures 1 and 2 on page 68.

Casting fits over end of tee bar and is held in place by $\frac{1}{8}$ x1-inch set screw.

Distance, top of tee bar to center of hole for strand is 12 inches. Hole for strand is $\frac{5}{8}$ inch in diameter.

Code Word
Marined.

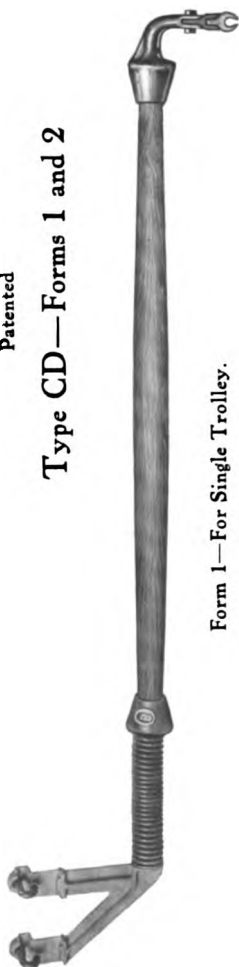
No.
11472—Guide Fitting, Japped, for 2 $\frac{1}{2}$ x2 $\frac{1}{4}$ x $\frac{1}{4}$ -inch Tee Bar.

List per 100
\$110 00

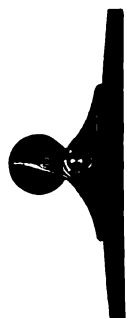
Catenary Steady Strains

Patented

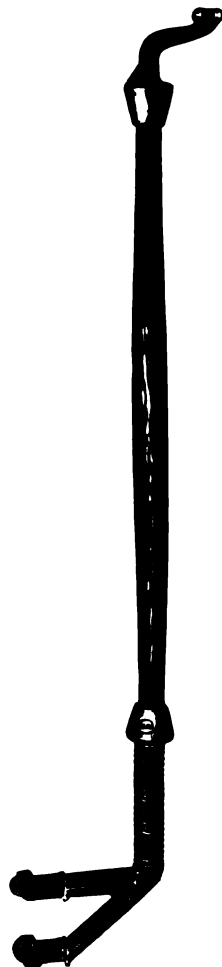
Type CD—Forms 1 and 2



Form 1—For Single Trolley.



End view of bracket casting showing offset to eliminate dripping of water from bracket arm onto steady arm.



Form 2—For Double Trolley.

See description and listing on the following page.



Catenary Steady Strain

Patent Applied For

Type CD—Forms 1 and 2

Continued

USED in pole bracket construction on catenary lines up to 6,600 volts for aligning trolley wire on curves and preventing it from swaying on tangents. Designed for mounting on Tee Bar Brackets listed on page 39.

Spring connection between the arm and bracket casting provides flexibility in all directions and is an improvement over designs which are flexible in vertical plane only.

Bracket casting has an offset (see end view on preceding page) to bring wood arm out from under pole bracket arm, thus preventing water dripping from one to the other and eliminating deposits of rust.

Bracket casting affords proper clearance between steady arm and pantograph collector when distance between messenger and trolley wire at bracket is 23 inches.

Spring cannot be elongated appreciably by ordinary strains under which it is installed and takes almost entire weight of arm off the trolley wire.

Form 1 is for single trolley and is provided with a 12-inch extruded metal ear for 4-0 grooved wire, with malleable boss attached to clevis in the one-piece end casting, as shown on the preceding page.

Form 2 is for Duplex construction, outer end casting forming a clamp which will accommodate two 4-0 grooved trolley wires 2½ inches apart.

Wood arm is 1½ inches in diameter, second growth hickory, impregnated and varnished, and provides 4 feet of insulation.

All castings malleable iron, sherardized; steel spring, jappanned.

Code Word	No.	List Each
<i>Lingual.</i>	11422—Form 1, Steady Strain for 500 to 6,600 Volts.....	\$5 70
<i>Linguist.</i>	11423— " 2, " " " " 500 " 6,600 "	6 05

Above Steady Strains can be furnished to order for all sizes of Round, Figure 8 or Grooved Wires.

Orders should specify distance between Messenger and Trolley Wires at Bracket.

See pages 67 and 68 for data on Catenary Steady Construction.

See illustrations on preceding page.

Catenary Steady Strain

Type CA—11,000-17,000 Volts



USED in pole bracket construction for aligning trolley wire on curves and for preventing it from swaying on tangents. It is designed for mounting on Tee Bar Brackets shown on page 39.

Wood arm is second growth hickory, impregnated and varnished and provides 5 feet of insulation. Diameter of arm is $1\frac{1}{2}$ inches.

For 11,000 volts, Bracket Strain Insulator No. 10242 is used; for 17,000 volts Bracket Strain Insulator No. 10243 is used.

Bracket Strain Insulator is adjustable along bracket arm and takes a $2\frac{1}{4} \times 2\frac{1}{4} \times \frac{1}{4}$ -inch Tee Bar.

Clamp used is our Detroit—Form 4, Catalogue No. 8975, for 2-0, 3-0 and 4-0 grooved wire.

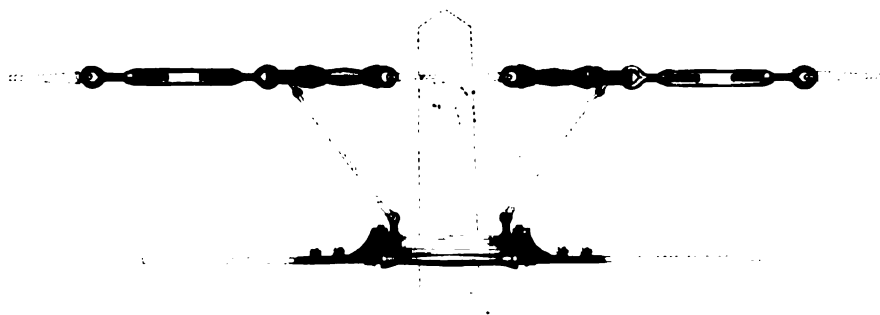
Bracket casting malleable iron, japanned; all other metal parts are sherardized.

Code Word	No.	List Each
<i>Isocrymal.</i>	10271—Type CA, Steady Strain for 11,000 Volts	\$ 7 70
<i>Isocryme.</i>	10272— “ “ “ “ “ “ 17,000 “	9 35
<i>Isouric.</i>	10274—Wood Arm for Steady Strain	2 55

Above Steady Strains can be furnished to order with Extruded Ears for all sizes of Round, Figure 8 or Grooved Wires.

Catenary Messenger and Trolley Section Insulator

Type CC—Patented
750-1,500 Volts



USED at pole brackets on 750 and 1500 volt catenary lines where it is desired to section both messenger and trolley wires.

No. 11112 for 750 volts consists of two $\frac{3}{4}$ x12-inch Turnbuckles, two 1 $\frac{1}{2}$ -inch Wood Strain Insulators with 5 inches of insulation, two connecting castings and a Section Insulator exactly similar to our Type A, Catalogue No. 9956 with the exception of having two suspension eyes with $\frac{3}{4}$ -inch openings.

No. 11113 for 1500 volts consists of two $\frac{3}{4}$ x12-inch Turnbuckles, two 1 $\frac{1}{2}$ -inch Wood Strain Insulators, with 12 inches of insulation, two connecting castings and a Section Insulator exactly similar to our Type A, Catalogue No. 10409 with the exception of having two suspension eyes with $\frac{3}{4}$ -inch openings.

Messenger cable is fastened to pole bracket at same heights as at points where no section insulator is installed, hence it is unnecessary to provide special length hangers in adjacent spans.

Section Insulator is amply strong to withstand breaking strain of trolley wire without buckling or allowing wire to slip. Will fit 3-0 and 4-0 Grooved Wire. Feeder lugs will accommodate 2-0 to 4-0 feeder wire.

All wood parts are impregnated and varnished; all metal parts except bronze end castings of section insulator are sherardized.

Code Word	No.	List Each
<i>Isography.</i>	11112—Messenger and Trolley Section Insulator for 750 Volts...	\$23 10
<i>Isolable.</i>	11113—“ “ “ “ “ “ 1,500 “ ...	27 50

Catenary Messenger Section Insulator

Type CB—6,600-11,000 Volts—Patented



A SIMPLE device for sectionizing messenger cable and insulating it from pole bracket.

A $\frac{5}{8}$ -inch steel rod designed to be tied into top groove of messenger Insulator, is equipped at the ends with clevises to which are fastened Strain Insulators. (Number 10955 for 6,600 volts and Number 10956 for 11,000 volts.)

Two $\frac{3}{4}$ -inch sherardized turnbuckles are attached to the insulators. Length center to center eyes, maximum 8 feet; minimum, 6 feet.

Code Word	No.	List Each
<i>Isocrymic.</i>	11108—Messenger Section Insulator for 6,600 Volts.....	\$ 8 80
<i>Isocyanic.</i>	11109— " " " " 11,000 "	10 80

Catenary Trolley Section Insulator

Type CA—6,600-11,000 Volts



MADE of selected white oak, impregnated and varnished, and heavy bronze end castings.

Can be used with wheel, sliding or roller contact. Runner piece is renewable.

Opening in suspension eye casting is $\frac{3}{4}$ inch.

No. 10260 provides 5 feet of insulation, length overall 8 feet, 9 $\frac{1}{4}$ inches.

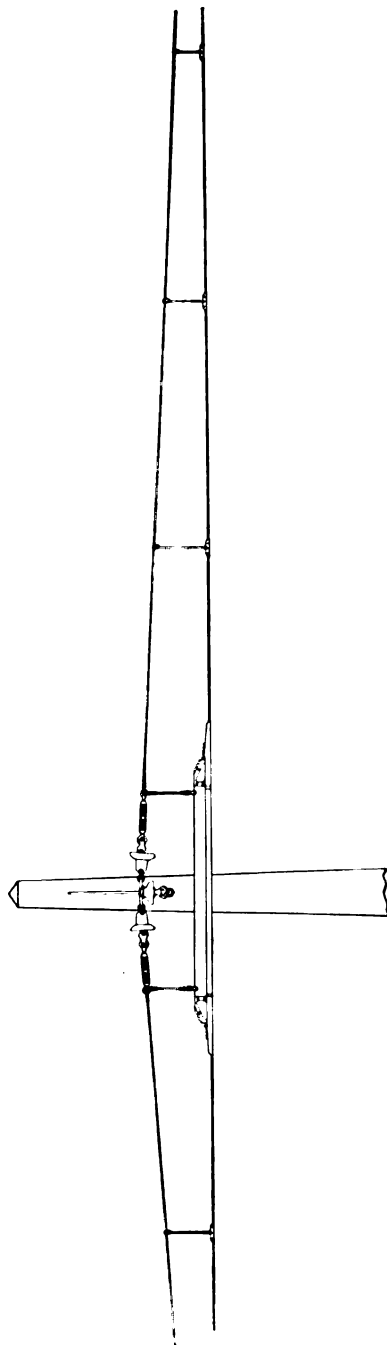
No. 10261 provides 9 feet of insulation; length overall 12 feet, 9 $\frac{1}{4}$ inches.

Feeder lug will take 4-0 stranded cable. Bolts and suspension castings are sherardized.

Code Word	No.	List Each
<i>Isogonic.</i>	10260—Trolley Section Insulator, 6,600 Volts, 4-0 Grooved Wire....	\$26 40
<i>Isogonism.</i>	10261— " " " " 11,000 " 4-0 " "	30 80

Method of Installing Catenary Section Insulators

Patented

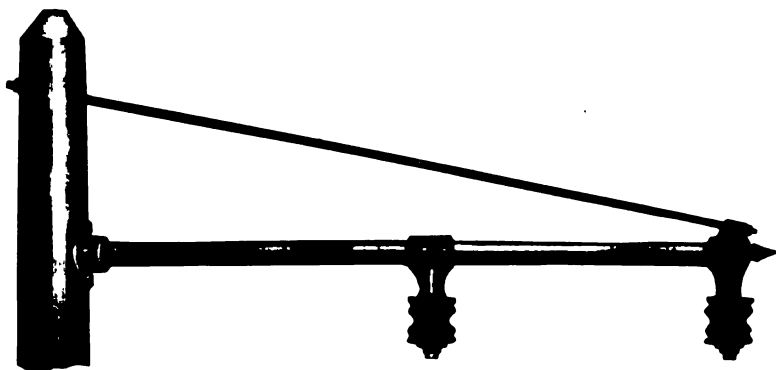


See page 74 for listing of Section Insulators

Insulated Pole Bracket

Type G—For Wood Poles

1,500 Volts



USED on 1500 volt construction, ample insulation being provided by two Porcelain Sleeve Insulators listed on page 78.

Trolley wire may be supported by either form of Suspension listed on page 77, suspension being attached to steel strand running between the two Sleeve Insulators.

Bracket arm is $1\frac{1}{2}$ -inch C Tubing or Iron Pipe; castings malleable iron; support rod, $\frac{5}{8}$ inch; support rod is 1 foot, 6 inches longer than arm.

Bracket arm fastened into pole casting by $\frac{3}{4}$ x3-inch square head machine bolt passing through both parts.

Pole casting drilled for $\frac{1}{2}$ x5-inch lag screws. Brackets are furnished complete as illustrated, except that lags are not furnished unless specified. All castings are malleable iron, japanned.

C Tubing

Code Word	No.	List per 100
<i>Albumen.</i>	10389— 9-foot Arm, $1\frac{1}{2}$ -inch C Tubing.....	\$550 00
<i>Alcohol.</i>	10390—10 " " $1\frac{1}{2}$ " "	583 00

Pipe

<i>Involute.</i>	11158— 9-foot Arm, $1\frac{1}{2}$ -inch Pipe.....	\$561 00
<i>Iodism.</i>	11159—10 " " $1\frac{1}{2}$ " "	594 00

Single Straight Line Suspensions

Uninsulated

Type C—Form 1



USED on Insulated Pole Bracket listed on page 76, and, while designed for straight line work, can be used on moderate curves. Will accommodate strand up to $\frac{1}{4}$ inch in diameter.

For severe curves Type D, Form 1 should be used.

Code Word
Alias.

No. 10407—Type C, Form 1, Suspension, Mall. Iron, Sher., $\frac{1}{4}$ -inch Stud. \$26 40
Above device is listed in bronze on page 184

List per 100

Type D—Form 1



INTENDED for use on the Insulated Pole Bracket listed on page 76. "U" bolts grip strands firmly, preventing slipping, so that device can be used on both straight line or curves.

Will accommodate strand up to $\frac{1}{4}$ inch in diameter.

Code Word
Alibi.

No. 10408—Type D, Form 1, Suspension, Mall. Iron, Sher., $\frac{1}{4}$ -inch Stud. \$132 00

List per 100

Porcelain Sleeve Insulator

1,500 Volts



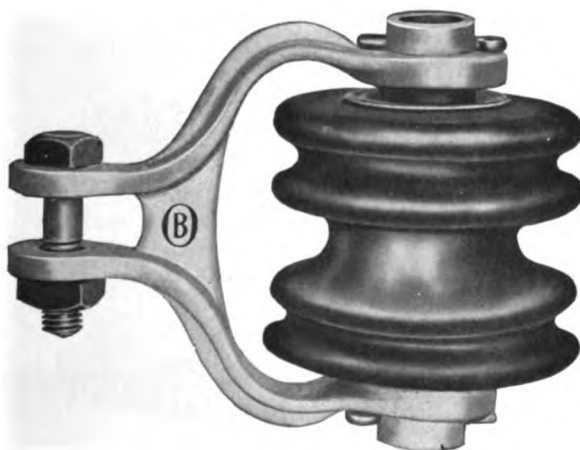
USED on Type G Pole Brackets listed on page 76, and also on Pole Strain Insulator listed on page 79. Glaze is dark brown in color.

Working voltage.....	1500
Diameter of insulator.....	4½ inches
Height of insulator.....	4 ⅝ "
Diameter of hole.....	1½ "
Diameter at bottom of center groove	3¼ "
Width of center groove	1 "

Code Word	No.	List per 100
<i>Alfa.</i>	10391—Sleeve Insulator for 1,500 Volts.....	\$40 70

Pole Strain Insulator

1500 Volts



USED at poles in 1500 volt span construction, and can hang in any position and still afford ample insulation.

The Porcelain Sleeve Insulator listed on page 78 is a part of this device and provides an ample factor of safety in insulation.

A broken porcelain can be quickly replaced by removing insulator pin, it being unnecessary to make up new strand joints.

In span work clevis can be attached directly to a $\frac{3}{4}$ -inch eyebolt fastened in pole.

Pole Casting and pin, japanned; bolt and cotter pin sherardized.

Code Word
Alienage.

No.	List per 100
10392—Pole Strain Insulator for 1,500 Volts.....	\$114 40

Type N Clevis Hangers

Double Insulation—Forms 1 and 2

1,500 Volts



Form 1—With Composition Strain Insulators



Form 2—With Wood Strain Insulators

CONSISTS of a Type N Insulated Hanger with standard clevis body and is provided with auxiliary insulation in the Form 1 by 2½-inch Composition Strain Insulators Number 11526 and in the Form 2 by 1x5-inch Standard Wood Strain Insulators Number 8574.

Either form of this Hanger is suitable for either bracket or cross span construction.

The diameter of the hanger shell is $3\frac{1}{8}$ inches.

The overall distance between eye centers of the Form 1 Hanger is 11 inches and in the Form 2 is 23 inches.

Code Word	No.	List per 100
<i>Maripul.</i>	11828—Form 1 Clevis Hanger, Sherardized, 1-inch Stud.....	\$173 80
<i>Alimony.</i>	10394—" 2 " " " " " "	149 60

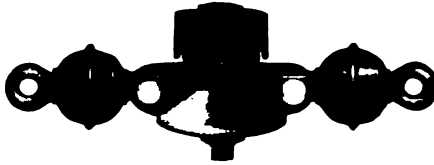
Above Hangers can be furnished to order with $\frac{3}{4}$ -inch Studs.

Type D Clevis Hangers

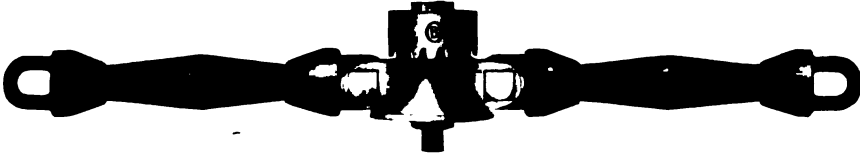
Patented

Double Insulation—Forms 1 and 2

1,500 Volts



Form 1—With Composition Strain Insulators



Form 2—With Wood Strain Insulators

THE hanger portion is similar to the Type D Hanger, Form 2 with the exception of the standard clevis body casting.

The Standard Type D Insulated Bolt is used and the auxiliary insulation is provided in the Form 1 Hanger by 2½-inch Composition Strain Insulators Number 11526 and in the Form 2 Hanger by 1x5-inch Standard Wood Strain Insulators Number 8574.

The overall distance between eye centers of the Form 1 Hanger is $10\frac{3}{4}$ inches and of the Form 2 Hanger $22\frac{1}{2}$ inches.

Code Word	No.	List per 100
<i>Maritime.</i>	11829—Form 1 Clevis Hanger, Sherardized, $\frac{1}{2}$ -inch Stud	\$176 00
<i>Allegory.</i>	10396— " 2 " " " " " "	154 00

Above Hangers can be furnished to order with 3/4-inch Studs.

Type C Single Straight Line Suspensions

Single Insulation—Form 2

1,500 Volts



No. 11806



No. 10398

USED for Pole Bracket or Cross Span Construction. Consists of a sherardized malleable iron body casting with clevis ends with bolts and cotter pins and a lock nut and stud.

Ample insulation is furnished by two 1x12-inch Wood Strain Insulators Number 8622.

Overall distance between eye centers is 38 inches.

Casting only, as listed below, may be used with two 1x5-inch Wood Strain Insulators (Number 8574) for 750 volt construction.

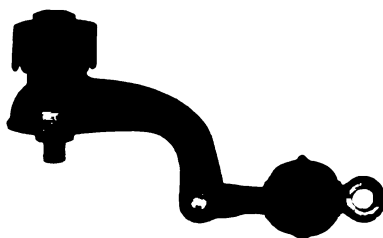
Code Word	No.	List per 100
<i>Allotter.</i>	10398—Type C, Form 2, Suspension, $\frac{3}{4}$ x2 $\frac{1}{2}$ -inch Stud.....	\$132 00
<i>Marjoram.</i>	11806—Casting only, with stud and clevis bolts.....	46 00

Type D Single and Double Curve Hangers

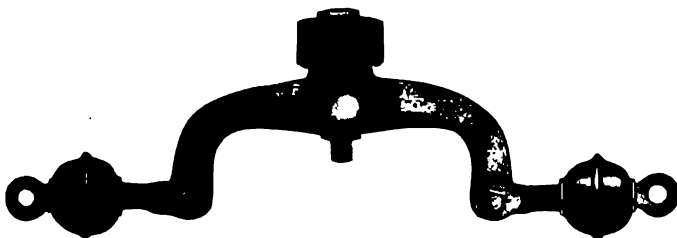
Patented

Form 2—With Composition Strain Insulators

1,500 Volts



Single Curve



Double Curve

THE hanger portion is our Standard Type D Single or Double Curve Hanger equipped with $2\frac{1}{4}$ -inch Composition Strain Insulators Number 11647 which afford ample auxiliary insulation.

The overall distance from the trolley wire to the center of insulator eye on the Single Curve Hanger is $8\frac{3}{4}$ inches, while the overall distance between eye centers on the Double Curve Hanger is $17\frac{1}{2}$ inches.

Code Word
Marksman.
Marlin.

No.		List per 100
11830—Single Curve Hanger, Mall. Iron, Sherardized,	$\frac{5}{8}$ -inch Stud.	\$141 80
11831—Double	" "	235 40

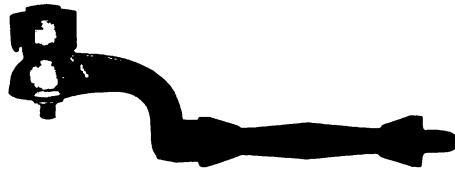
Above Hangers can be furnished to order with $\frac{3}{4}$ -inch Studs.

Type D Single and Double Curve Hangers

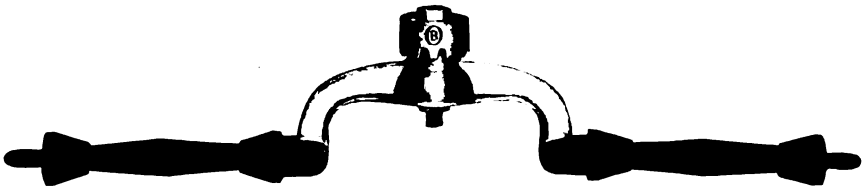
Patented

Form 3--With Wood Strain Insulators

1,500 Volts



Single Curve



Double Curve

CONSISTS of our Standard Type D Single and Double Curve Hangers equipped with our 1x5-inch Clevis Wood Strain Insulators, Number 9238, which provide the auxiliary insulation.

The overall distance from the trolley wire to the center of the insulator eye of the Single Curve Hanger is $13\frac{1}{2}$ inches, while the overall distance between eye centers of the Double Curve Hanger is $27\frac{1}{2}$ inches.

Code Word	No.	List per 100
<i>Alluring.</i>	10400—Single Curve Hanger, Mall. Iron, Sherardized, $\frac{1}{2}$ -inch Stud.	\$134 20
<i>Allusive.</i>	10402—Double " " " $\frac{1}{2}$ " "	202 40

Above Hangers can be furnished to order with $\frac{3}{4}$ -inch Studs.

Type C Single and Double Curve Pull-Overs

Form 2—With Wood Strain Insulators

1,500 Volts



Single Curve



Double Curve

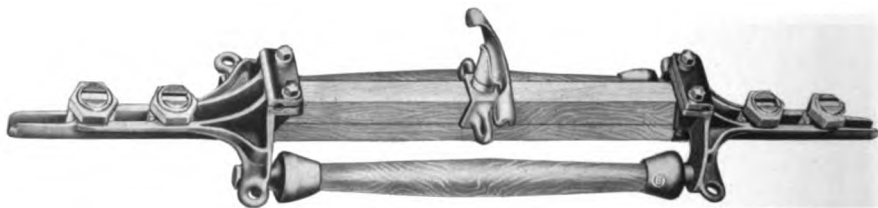
CONSISTS of a heavy malleable iron yoke, fitted with a Cap Nut and Stud. Ample insulation is provided by means of 1x12-inch Wood Strain Insulators Number 8622, which are attached to the yoke.

The overall distance from the trolley wire to the center of insulator eye on the Single Curve Hanger is 24 inches, while the overall distance between eye centers of the Double Curve Hanger is 48 inches.

Code Word	No.	List per 100
<i>Marmose.</i>	11832—Single Curve Hanger, Mall. Iron, Sher., $\frac{1}{2}$ x2 $\frac{1}{2}$ -inch Stud. . . .	\$ 99 00
<i>Marplot.</i>	11833—Double " " " $\frac{1}{2}$ x2 $\frac{1}{2}$ "	176 00

Type A Section Insulator

Form 1—Bronze—1500 Volts



USED on 1500 Volt construction to insulate one section of trolley wire from another and offer an unobstructed passage for trolley wheel from section to section.

Two substantial end castings of bronze terminate in grooved ends for attachment to trolley wire and are held together by two $1\frac{1}{4}$ -inch Wood Strain Insulators giving 12 inches of insulation. The $\frac{3}{8}$ -inch machine bolts which thread into cap castings of Strains are secured by lock washers.

Suspension and runner bars are separate pieces of impregnated and varnished hard wood and fit into sockets in end castings; runner bar being held in place by two cotter pins, which pass through holes drilled in end castings, is easily replaced.

A feeder wire connection for a 2-0 to 4-0 solid or stranded feeder wire is provided on top of each end casting.

The entire pull of trolley wires is sustained by two Wood Strain Insulators in the same plane as trolley wire and there is no tendency to buckle.

Clamping wedges form an exceptionally strong attachment for trolley wires, and largest sizes of wire may be broken before slippage occurs.

A universal suspension casting provides means for suspending from cross span wire, a $\frac{5}{8}$ -inch threaded boss for attaching to a hanger stud and a pair of eyes with $\frac{1}{2}$ x1-inch holes for fastening to guy wires.

Length overall, $36\frac{5}{8}$ inches; suspension bar, $1\frac{1}{2}$ x1 $\frac{1}{8}$ x16 $\frac{5}{8}$ inches; runner bar, $1\frac{9}{16}$ x1 $\frac{1}{8}$ x16 $\frac{5}{8}$ inches.

Holes in eyes on end castings are $\frac{1}{2}$ inch in diameter.

Code Word
Amateurs.
Ambler.

No.	List per 100
10409—Insulator for 0, 2-0, 3-0 & 4-0 Rd., Fig. 8 & Grooved Wires.	\$187 00
10410—Runner Piece.....	11 00

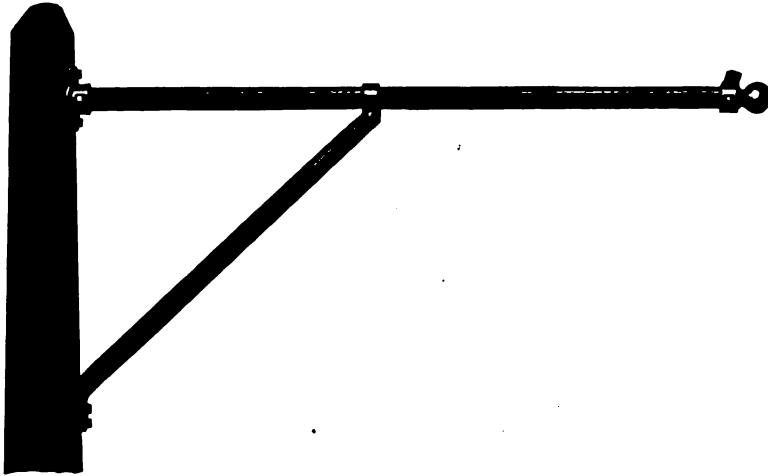
Can be furnished with $\frac{3}{4}$ -inch boss on special order.

Can be furnished with renewable bronze tips on special order.

This insulator for use on 750 Volt work is shown on page 185.

Rigid Pole Bracket

Single Bracket, for Wood Poles—750 Volts



MADE of A Tubing only, horizontal arm being $1\frac{1}{2}$ inches, strut $1\frac{1}{4}$ inches.

Arm slips into pole casting and is held in place by a $\frac{3}{8}$ -inch machine bolt passing through casting and end of tubing.

Casting has a solid back which affords a bearing for end of arm and protects wood pole.

All castings are malleable iron, japanned.

Holes in pole castings and strut are for $\frac{1}{2}$ x4-inch lag screws but lags are not furnished unless specified.

Bracket lengths listed are distances from pole to outer end of horizontal arm, but do not include projecting end casting.

Code Word	No.	List per 100
<i>Aback.</i>	10454—4-foot Arm, $1\frac{1}{4}$ -inch A Tubing.....	\$242 50
<i>Abaiser.</i>	10455—6 " " $1\frac{1}{4}$ " "	400 00

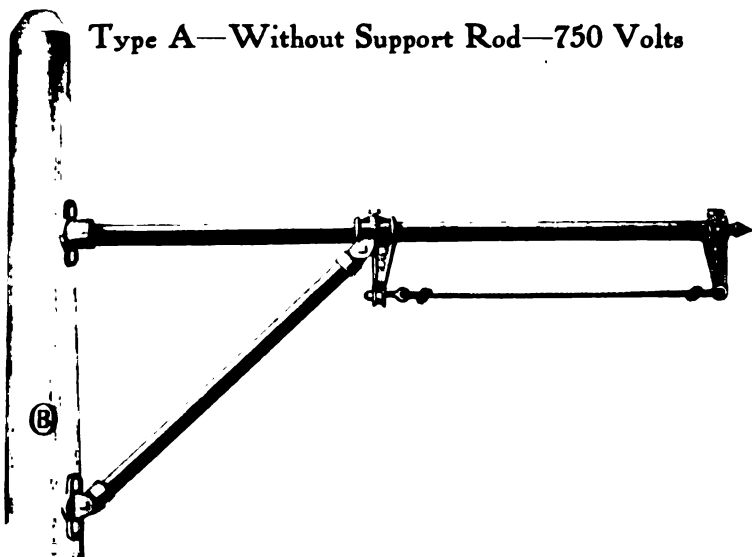
Brackets for Iron Poles furnished to order.

For listing of parts for above Brackets, see page 91.

Flexible Pole Bracket

Single Bracket, for Wood Poles

Type A—Without Support Rod—750 Volts



MADE of either C Tubing or Pipe. Strut is threaded on both ends and is $1\frac{1}{4}$ inches and $1\frac{1}{2}$ inches respectively, for use with the $1\frac{1}{2}$ -inch and 2-inch arms.

Bracket arm is threaded into pole casting which has a solid back to protect wood pole. Strand is $\frac{1}{4}$ inch, galvanized, and eye bolt is $\frac{1}{2} \times 5$ inches, plain finish.

Pole castings have holes for $\frac{1}{2} \times 4$ -inch lag screws but lags are not furnished unless specified. All castings malleable iron, japanned.

Bracket lengths listed are distances from pole to outer end of horizontal arm, but do not include projecting end casting.

C Tubing

Code Word	No.	List per 100
<i>Abaist.</i>	3403— 9-foot Arm, $1\frac{1}{4}$ -inch C Tubing.....	\$531 30
<i>Abase.</i>	8787—10 " " $1\frac{1}{2}$ " "	572 90
<i>Abash.</i>	3409— 9 " " 2 " "	635 25
<i>Abater.</i>	8789—10 " " 2 " "	699 95

Pipe

<i>Invasive.</i>	10990— 9-foot Arm, $1\frac{1}{4}$ -inch Pipe.....	\$519 75
<i>Invected.</i>	10991—10 " " $1\frac{1}{2}$ " "	561 35
<i>Inveigher.</i>	10992— 9 " " 2 " "	612 15
<i>Invenom.</i>	10993—10 " " 2 " "	630 65

Brackets for Iron Poles furnished to order.

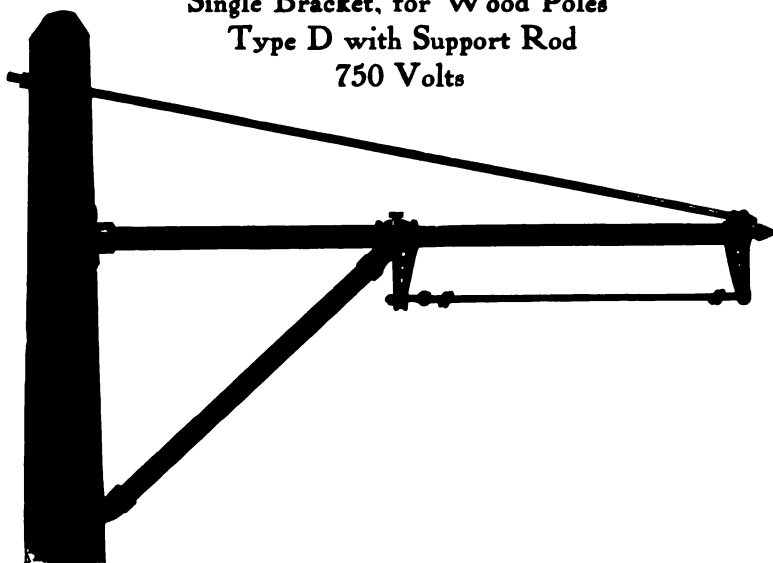
For listing of parts for above Brackets, see page 91.

Flexible Pole Bracket

Single Bracket, for Wood Poles

Type D with Support Rod

750 Volts



MADE of either C Tubing or Pipe. Strut is threaded on both ends and is $1\frac{1}{4}$ inches and $1\frac{1}{2}$ inches respectively, for use with the $1\frac{1}{2}$ -inch and 2-inch arms.

Bracket arm is threaded into pole casting which has a solid back to protect wood pole. Strand is $\frac{1}{4}$ inch, galvanized and eye bolt is $\frac{1}{2} \times 5$ inches, plain finish.

Support rods as furnished with the $1\frac{1}{2}$ -inch and 2-inch arms have $\frac{7}{8}$ -inch and $\frac{1}{2}$ -inch U. S. S. rolled threads, respectively. Lengths of support rods are 10 feet, 6 inches and 11 feet, 6 inches, respectively, on the 9 and 10-foot Brackets. A beveled iron washer for use at pole is included with support rod.

Pole castings have holes for $\frac{1}{2} \times 4$ -inch lag screws but lags are not furnished unless specified. All castings malleable iron japanned.

Bracket lengths as listed are distances from pole to outer end of horizontal arm, but do not include projecting end casting.

Code Word	No.	C Tubing				List per 100
		3493—	9-foot Arm,	$1\frac{1}{2}$ -inch C Tubing		
<i>Abature.</i>	5521—10	"	"	$1\frac{1}{2}$	"	\$577 50
<i>Abawed.</i>	5521—10	"	"	$1\frac{1}{2}$	"	623 70
<i>Abbatial.</i>	3499—9	"	"	2	"	681 45
<i>Abdess.</i>	5529—10	"	"	2	"	750 75
		Pipe				
		10994—	9-foot Arm,	$1\frac{1}{2}$ -inch Pipe		
<i>Inventful.</i>	10995—10	"	"	$1\frac{1}{2}$	"	\$565 95
<i>Investive.</i>	10995—10	"	"	$1\frac{1}{2}$	"	612 15
<i>Investure.</i>	10996—9	"	"	2	"	658 35
<i>Invious.</i>	10997—10	"	"	2	"	681 45

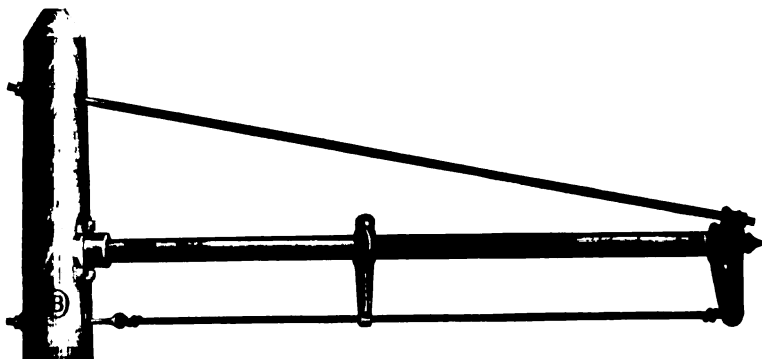
Brackets for Iron Poles furnished to order.

For listing of parts for above Brackets, see page 91.

Flexible Pole Bracket

Single Bracket, for Wood Poles

Type B—750 Volts



MADE with either A or C Tubing or Pipe arms. Arm bears against the solid back of the socket casting, being held in place by the tension of the support rod and strand. Strand is $\frac{1}{4}$ inch diameter, galvanized; eye bolt is $\frac{1}{2}$ x12 inches, plain finish. All castings are malleable iron, japanned.

Pole castings have holes for $\frac{1}{2}$ x4-inch lag screws but lags are not furnished unless specified.

Support rods, as furnished with the $1\frac{1}{2}$ -inch and 2-inch arms, have $\frac{7}{16}$ -inch and $\frac{1}{2}$ -inch U. S. S. rolled threads respectively. Lengths of support rods are 10 feet, 6 inches and 11 feet, 6 inches, respectively, on the 9 and 10-foot Brackets. A beveled iron washer for use at pole is included with support rod.

Bracket lengths as listed are distances from pole to outer end of horizontal arm, but do not include projecting end casting.

		A and C Tubing			
Code Word	No.			List	per 100
Abbey.	9062—	9-foot Arm, $1\frac{1}{2}$ -inch C Tubing.....		\$358	00
Abbot.	9063—	9 " " " " $1\frac{1}{2}$ " A "		329	70
Abdicate.	9065—	10 " " " " $1\frac{1}{2}$ " C "		381	10
Abditive.	9066—	10 " " " " $1\frac{1}{2}$ " A "		353	40
Abducent.	9071—	9 " " " " 2 " C "		427	30
Abduct.	9072—	9 " " " " 2 " A "		404	20
Abductor.	9074—	10 " " " " 2 " C "		473	50
Abeam.	9075—	10 " " " " 2 " A "		438	90

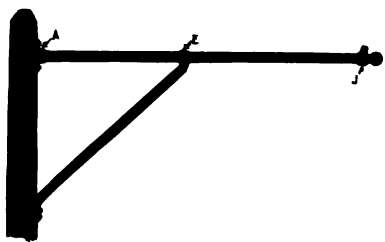
Pipe

Invirile.	10998—	9-foot Arm, $1\frac{1}{2}$ -inch Pipe.....	\$358	00
Invision.	10999—	10 " " " " $1\frac{1}{2}$ " "	404	20
Invider.	11000—	9 " " " " 2 " "	427	30
Involucre.	11001—	10 " " " " 2 " "	462	00

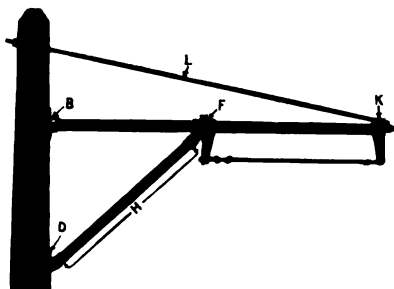
Brackets for Iron Poles furnished to order.

For listing of parts for above Brackets, see page 91.

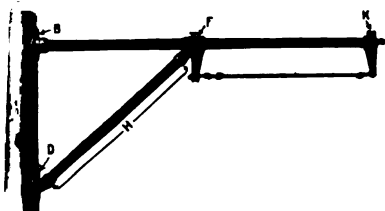
Pole Bracket Parts



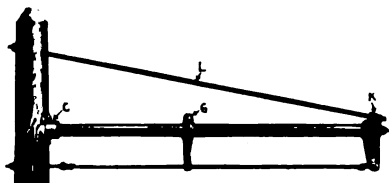
Rigid Bracket



Type D Bracket



Type A Bracket



Type B Bracket

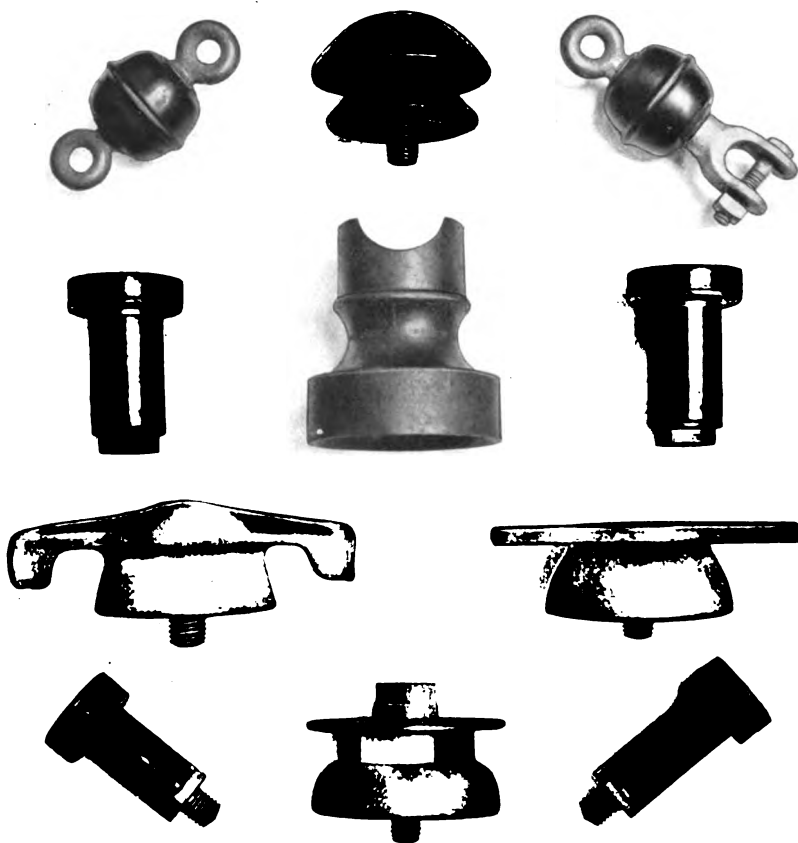
CASTINGS are furnished complete with the necessary set screws or bolts. Bolts for attaching Strut End Castings are included with Inner Span Holder and Lower Pole Castings. Lag screws are not included with Pole Castings. All castings, malleable iron, japanned.

Support rods are furnished with nuts and beveled iron washer for pole end.

Code Word	No.	Part	List per 100
Marshall.	11807	A Upper Pole Casting for 1½-inch Arm, with Bolt.....	\$29 20
Marshy.	11808	B " " " " 1½ " " Threaded.....	26 15
Martin.	11809	B " " " " 2 " " " ".....	29 20
Martinet.	11810	C " " " " 1½ " " Not Threaded ..	29 20
Martile.	11811	C " " " " 2 " " " ".....	39 50
Martlet.	11812	D Lower " "	21 95
Martyr.	11813	E Split Brace Casting for 1½-inch Arm.....	17 15
Marvel.	11814	F Inner Span Holder Casting for 1½-inch Arm.....	45 20
Mascle.	11815	F " " " " 2 " " ".....	51 25
Masher.	11816	G Guide " " 1½ " " ".....	29 30
Maskery.	11817	G " " 2 " " ".....	32 70
Massage.	11818	H Strut End " " 1½ " " Strut.....	24 46
Massicot.	11819	H " " 1½ " " ".....	25 20
Mastery.	11820	J Ball End " " 1½ " " Arm.....	32 35
Mastful.	11821	K Outer Span Holder " " 1½ " " ".....	44 35
Mastiff.	11822	K " " " " 2 " " ".....	49 50
Masting.	11823	L Support Rod, 1½ inch x 10 feet 6 inches.....	56 95
Malaco.	11824	L " " 1½ " x 11 " 6 ".....	61 05
Matcher.	11825	L " " 1½ " x 10 " 6 ".....	61 25
Matinal.	11826	L " " 1½ " x 11 " 6 ".....	62 95

For listing of Eye Bolts see page 226.

Dirigo Insulation



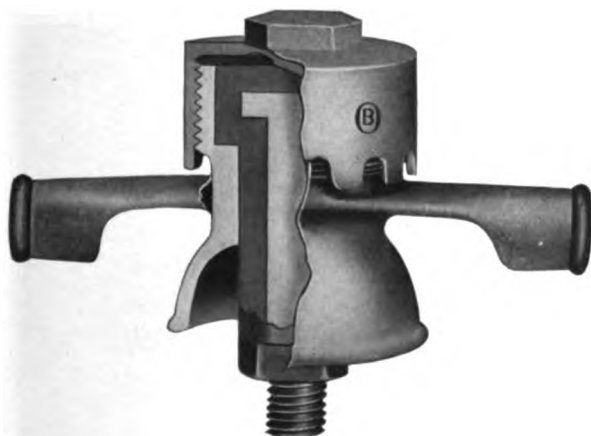
DIRIGO Insulation has almost reached its twentieth year of service and has established an enviable record for long life.

During that time it has been gradually developed to its present state of high efficiency as the result of exhaustive tests and careful study of its behavior both in the laboratory and under widely different service conditions.

Before shipment, all O-B devices made with Dirigo Insulation are given electrical and mechanical tests, greatly in excess of conditions encountered in service, thus insuring a liberal factor of safety on the line.

Type D Hangers

750 Volts—Patented



Sectional View of Type D Straight Line Hanger

ALL Type D Hangers listed on succeeding pages possess the following excellent features:

Insulated Bolt has two broad flat surfaces for application of wrench to attach ear or clamp.

Cap is provided with a hex for wrench and row of lugs around lower edge, one or two of which are intended to be turned under and lock cap securely in position and prevent bolt from working loose in service.

Leather washer between cap and head of bolt provides friction to prevent bolt from turning.

Threaded portion of body casting is $2\frac{1}{8}$ inches in diameter; bottom of skirt $2\frac{1}{8}$ inches in diameter, except in Form 2 which is $3\frac{1}{8}$ inches in diameter.

Head of Type D Insulated Bolt is $1\frac{1}{8}$ inches in diameter as against $1\frac{1}{16}$ inches for our Type M (West End) Bolt, hence presents a broader bearing surface.

Type D Hangers

750 Volts—Patented

Straight Line—Form 1



Well adapted for all ordinary service conditions.

Threaded portion of body is $2\frac{1}{8}$ inches in diameter.

Bottom of skirt is $2\frac{1}{8}$ inches in diameter.

Hanger includes Type D Bolt No. 2018 or 6457.

Code Word	No.	List per 100
<i>Abearing.</i>	2022—Form 1 Hanger, Mall. Iron. Sherardized, D Bolt, $\frac{1}{2}$ -inch Stud.	\$73 95
<i>Aberrant.</i>	6460— “ 1 “ “ “ “ “ $\frac{3}{4}$ “	76 25

Type D Hangers

750 Volts—Patented

Straight Line—Form 2



PREFERRED to Form 1 Hanger where conditions are particularly severe.

Body portion is heavier than Form 1 and broader skirt affords increased protection to lower end of insulated bolt.

Arms are reinforced by webs.

Threaded portion of body is $2\frac{1}{8}$ inches in diameter.

Bottom of skirt is $3\frac{3}{8}$ inches in diameter.

Hanger includes Type D Bolt No. 2018 or 6457.

Code Word	No.	List per 100
<i>Aberr.</i>	10380—Form 2 Hanger, Mall. Iron, Sherardized, D Bolt, $\frac{1}{2}$ -inch Stud.	\$78 55
<i>Abel.</i>	10381— " 2 " " " " " " " " "	80 85

Type D Hangers

750 Volts—Patented

Single Curve



AMPLE clearance for all standard trolley wheels and harps is provided, the distance from center of threaded stud to inner edge of arm being $3\frac{5}{8}$ inches.

Hole for span wire is $\frac{1}{2}$ inch in diameter.

Hanger includes Type D Bolt No. 2018 or 6457.

Code Word	No.	List per 100
<i>Abeyance.</i>	2045—Single Curve Hanger, Mall. Iron, Sherardized, $\frac{1}{2}$ -inch Stud . . .	\$78 55
<i>Abhorrer.</i>	6496— “ “ “ “ “ “ $\frac{3}{4}$ “	80 85

Type D Hangers

750 Volts—Patented

Double Curve



AMPLE clearance for all standard trolley wheels and harps is provided, the distance across inside of yoke being $7\frac{1}{4}$ inches.

Holes for span wire are $\frac{1}{2}$ inch in diameter.

Hanger includes Type D Bolt No. 2018 or 6457.

Code Word	No.	List per 100
Abiliment.	2048—Double Curve Hanger, Mall. Iron, Sherardized, $\frac{1}{2}$ -inch Stud...	\$ 92 40
Abject.	6499— " " " " " $\frac{1}{2}$ " ...	108 60

Type D Hangers

750 Volts—Patented

Bridge



HHEIGHT from top of Hanger to top of threads on insulated bolt is $3\frac{3}{8}$ inches and diameter of skirt at bottom is $2\frac{1}{8}$ inches. Takes $\frac{1}{2}$ -inch lag screws spaced $3\frac{1}{2}$ inches between centers.

Hanger includes Type D Bolt No. 2018 or 6457.

Code Word	No.	List per 100
<i>Abloom.</i>	2037—Bridge Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud	\$70 40
<i>Ablude.</i>	6466—“ “ “ “ “ “	72 60

Barn



HHEIGHT from top of Hanger to top of threads on insulated bolt is 3 inches. Takes $\frac{1}{2}$ -inch lag screws spaced 4 inches between centers.

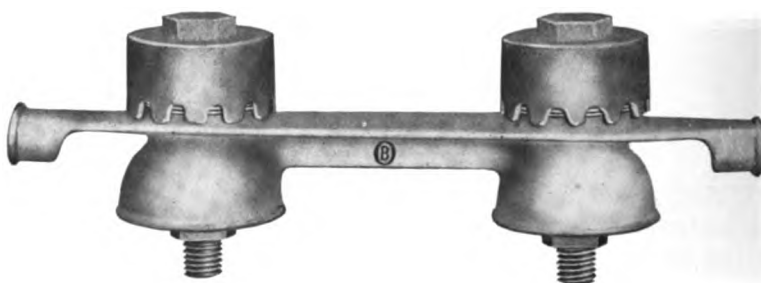
Hanger includes Type D Bolt No. 2018 or 6457.

Code Word	No.	List per 100
<i>Ablegate.</i>	6480—Barn Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud	\$46 20
<i>Ableness.</i>	6481—“ “ “ “ “ “	48 40

Type D Hangers

750 Volts—Patented

Twin Straight Line



HANGER bodies are similar to our Standard Type D Hanger and possess all the advantages of this popular type.

Ample clearance is provided for the trolley wheel and harp, the separation between the two parallel trolley wires being 6 inches.

Connecting arm is made with heavy section which precludes possibility of Hanger buckling in service.

Threaded portion on hanger bodies is $2\frac{1}{8}$ inches in diameter and bottom of skirts $2\frac{1}{8}$ inches in diameter.

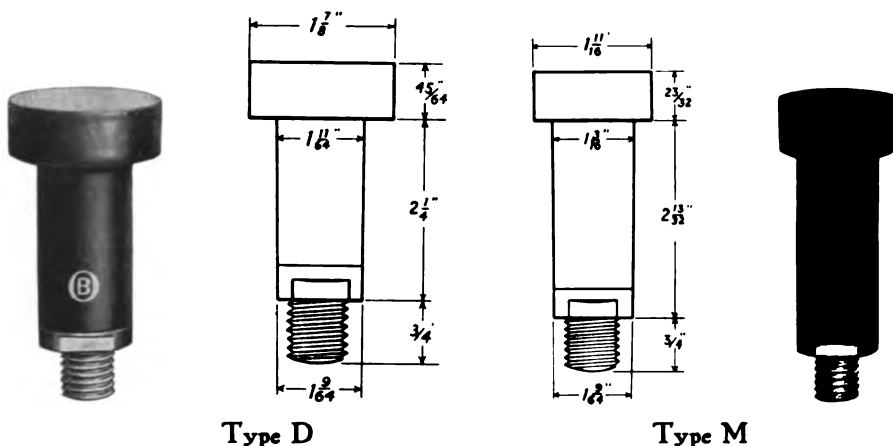
Hanger includes Type D Bolts No. 2018 or 6457.

Code Word	No.	List per 100
<i>Ablution.</i>	3185—Twin Hanger, Malleable Iron, Sherardized, $\frac{1}{8}$ -inch Studs	\$176 00
<i>Abnodate.</i>	6506— " " " " " $\frac{1}{8}$ "	176 00

Twin Single or Double Curve Hangers furnished to order.

Insulated Bolts

Types D and M—750 Volts



Type D

Type M

CONSIST of a sherardized forged steel stud effectively insulated by Dirigo Insulation.

Lower portion has two broad, flat surfaces for application of wrench. Dimensions as shown above apply both to $\frac{5}{8}$ -inch and $\frac{3}{4}$ -inch Bolts.

Type D Bolts—For O-B Type D Hangers

Code Word	No.	List per 100
Abnormal.	2018—Insulated Bolt, Type D, $\frac{5}{8}$ -inch Stud, Sherardized	\$30 80
Abodance.	6457— “ “ “ D, $\frac{3}{4}$ “ “	33 00

Type M Bolts—For O-B Type M Hangers or Any Standard “West End” Hangers

Abutment.	2054—Insulated Bolt, Type M, $\frac{5}{8}$ -inch Stud, Sherardized	\$30 80
Academic.	6528— “ “ “ M, $\frac{3}{4}$ “ “	33 00

Type M Hangers

750 Volts—Patented

Double Curve



AMPLE clearance for all standard trolley wheels and harps is provided, the distance across the inside of the yoke being $7\frac{1}{4}$ inches.

Holes for span wire are $\frac{1}{2}$ inch in diameter.

Hanger includes Type M Bolt No. 2054 or 6528.

Code Word	No.	List per 100
<i>Abridger.</i>	3178—Double Curve Hanger, Mall. Iron, Sherardized, $\frac{1}{2}$ -inch Stud . .	\$88 00
<i>Abrogate.</i>	6551— " " " " " " " " . . .	90 20

Type M Hangers

Barn—750 Volts

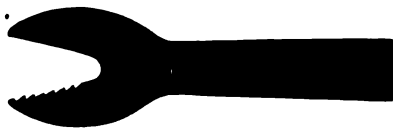


HHEIGHT from top of hanger to top of threads on insulated bolt is $3\frac{1}{8}$ inches and bottom of skirt is $2\frac{1}{8}$ inches in diameter. Takes $\frac{1}{2}$ -inch lag screws spaced $3\frac{1}{8}$ inches between centers.

Hanger includes Type M Bolt No. 2054 or 6528.

Code Word	No.	List per 100
Absorber.	3985—Barn Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud	\$57 20
Abstain.	6534— " " " " " " $\frac{1}{2}$ " "	59 40

Types D and M Hanger Wrench



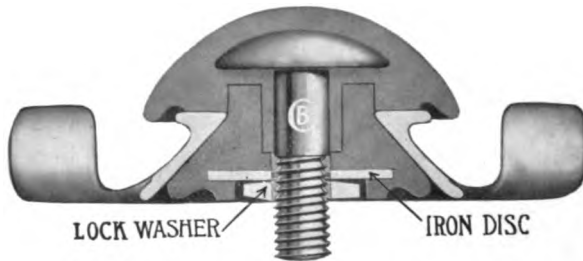
FITS interchangeably insulated bolts and hanger caps on Types D and M Hangers.

Code Word	No.	List per 100
Aborted.	2020—Hanger Wrench, Sherardized	\$33 00

Type G Hangers

750 Volts—Patented

Straight Line



Sectional View Showing Lock Cone and Washer

INSULATOR Cap and Cone are made of Dirigo Insulation moulded around a forged steel, sherardized, stud bolt.

Surface leakage between stud bolt and body casting is practically eliminated as cap and cone are dove-tailed together.

Stud is made with head larger in diameter than center opening in hanger body, eliminating possibility of stud bolt pulling through hanger casting even if insulation should accidentally become broken.

Hangers and Cones are listed as "Lock" and "Plain."

"Lock" type is shown clearly in above cut and differs from "Plain" only in having lock washer added and having a recess for washer in lower face of cone and an iron disc moulded in place to provide bearing surface for washer.

Lower face of lock washer bears against top of ear boss or clamp.

The "Lock" Cone is far superior to the "Plain" Cone and other Cones on the market, as it absolutely prevents caps from working loose in service.

Code Word	No.	List per 100
<i>Absume.</i>	10432—Hanger, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Stud, Plain Cone	\$59 70
<i>Absurd.</i>	10433— " " " " " " Lock "	61 10
<i>Abuser.</i>	10434— " " " " " " Plain "	59 70
<i>Academy.</i>	10435— " " " " " " Lock "	61 10
<i>Accite.</i>	10436—Casting only, Malleable Iron, Sherardized.....	22 20

Type G Hangers

750 Volts—Patented

Single Curve



AMPLE clearance for all standard trolley wheels and harps is provided, the distance from center of threaded stud to inner edge of arm being $4\frac{3}{8}$ inches.

Hole for span wire is $\frac{1}{4}$ inch in diameter.

Code Word	No.	List per 100
<i>Accloy.</i>	10437—Hanger, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Stud, Plain Cone	\$64 50
<i>Accoast.</i>	10438— “ “ “ “ “ “ Lock “	65 95
<i>Accruer.</i>	10439— “ “ “ “ “ “ Plain “	64 50
<i>Accumb.</i>	10440— “ “ “ “ “ “ Lock “	65 95
<i>Acentic.</i>	10441— “ Casting only, “	27 05

For description and advantages of Lock Cones, see page 106.

Type G Hangers

750 Volts—Patented

Double Curve



AMPLE clearance for all standard trolley wheels and harps is provided, the distance across the inside of the yoke being $8\frac{3}{4}$ inches.

Holes for span wire are $\frac{7}{8}$ inch in diameter.

Code Word	No.	List per 100
<i>Acerbate.</i>	10442—Hanger, Malleable Iron, Sherardized, $\frac{5}{8}$ -inch Stud, Plain Cone	\$74 20
<i>Acetify.</i>	10443— “ “ “ “ $\frac{5}{8}$ “ Lock “	75 60
<i>Acidity.</i>	10444— “ “ “ “ $\frac{3}{4}$ “ Plain “	74 20
<i>Acorn.</i>	10445— “ “ “ “ $\frac{3}{4}$ “ Lock “	75 60
<i>Acraze.</i>	10446— “ Casting only, “	36 70

For description and advantages of Lock Cones, see page 106.

Type G Hangers

750 Volts—Patented

Pole Bracket Hanger



HHEIGHT from top of ear boss to bottom of pole bracket arm is $3\frac{1}{8}$ inches.

Casting is malleable iron, sherardized.

Code Word	No.	List per 100
<i>Acrimony.</i>	8898—Hanger, Sher., for $1\frac{1}{2}$ -inch Tubing, $\frac{3}{8}$ -inch Stud, Plain Cone	\$102 95
<i>Acrobat.</i>	8899—“ “ $1\frac{1}{2}$ “ “ “ Lock “	104 25
<i>Actable.</i>	8900—“ “ $1\frac{1}{2}$ “ “ “ Plain “	102 95
<i>Activate.</i>	8901—“ “ $1\frac{1}{2}$ “ “ “ Lock “	104 25
<i>Actress.</i>	8815—“ Casting only, Sherardized, for $1\frac{1}{2}$ -inch Tubing.....	65 45
<i>Actuary.</i>	8816—“ Sher., for 2-inch Tubing, $\frac{3}{8}$ -inch Stud, Plain Cone.	113 05
<i>Actuate.</i>	8817—“ “ 2 “ “ “ Lock “	114 40
<i>Acuity.</i>	8818—“ “ 2 “ “ “ Plain “	113 05
<i>Acumen</i>	8819—“ “ 2 “ “ “ Lock “	114 40
<i>Adage.</i>	8820—“ Casting only, Sherardized, for 2-inch Tubing.....	75 55

For description and advantages of Lock Cones, see page 106.

Type G Hangers

750 Volts—Patented

Barn



ARRANGED for four bolts or lag screws, $\frac{5}{8}$ inch in diameter. Short distance between centers of holes is 2 inches; long distance, 6 inches

Height from top of ear boss to top of lugs is $2\frac{1}{2}$ inches.

Code Word	No.	List per 100
Accentor.	5454—Hanger, Malleable Iron, Sherardized, $\frac{5}{8}$ -inch Stud, Plain Cone...	\$80 00
Accosted.	5455—“ “ “ “ “ “ Lock “ ...	81 30
Accouple.	5456—“ “ “ “ “ “ Plain “ ...	80 00
Accrete.	5457—“ “ “ “ “ “ Lock “ ...	81 30
Accrouch.	8666—“ Casting only, Sherardized.....	42 50

For description and advantages of Lock Cones, see page 106.

Type G Insulator Caps and Cones

750 Volts—Patented



Cap



Cone

MADE of Dirigo Insulation and used interchangeably with Type G Hangers listed on the preceding pages and with all standard Cap and Cone Hangers of other makes. They cannot be used with Type W Hangers.

Stud in Cap is made of forged steel, sherardized.

Cone is listed both plain and with lock washer. Lock Cone is far superior to other Cones on the market because it absolutely prevents the Cap from working loose in service.

Cap is 3½ inches and Cone 3 inches in diameter.

Code Word	No.	List per 100
<i>Adagial.</i>	5440—Insulator Cap, ½-inch Stud, Sherardized.....	\$24 50
<i>Adamant.</i>	5441— " Cone, Plain, for ½-inch Stud.....	13 00
<i>Adaply.</i>	5442— " " Lock, " ½ " " ".....	14 40
<i>Adaunt.</i>	5443— " Cap, ¾-inch Stud, Sherardized.....	24 50
<i>Addeem.</i>	5444— " Cone, Plain, for ¾-inch Stud.....	13 00
<i>Adder.</i>	5445— " " Lock, " ¾ " " ".....	14 40

For description and advantages of Lock Cones, see page 106.

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Throw-In Hanger Wrench



As used with Type F or N Hangers

CAN be used for installing any type of straight line Hanger, listed in this Catalogue, upon the span wire.

It consists of a one-piece forging with circular jaws, one of which is provided with a hook and the other with a V-shaped notch.

The Hanger is first put into place with one of the hanger suspension lugs on the span wire and the wrench is then applied and the Hanger turned sufficiently to permit the other suspension lug to be hooked over the span wire as shown in the illustration.

It can also be used for seating trolley wire in grooves of frogs or cross-overs while the clamping parts are being put into place.

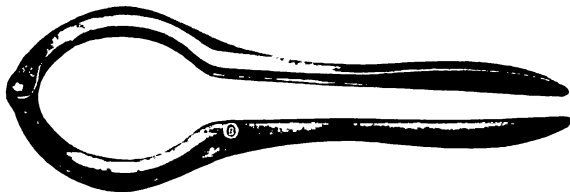
It is almost universal in application and saves time in installation. Length overall is 20 inches.

Code Word
Haunter.

No. 10625—Throw-In Hanger Wrench, Japanned.....

List Each
\$2 20

Cap and Cone Hanger Wrench



DESIGNED for holding cap of Type G Straight Line, Single and Double Curve Hangers while ear or clamp is being screwed tightly into place.

Contour of jaws is such that great gripping power is obtained without danger of injuring insulation.

Code Word
Hausee.

No. 10675—Cap and Cone Hanger Wrench, Mall. Iron, Japanned.

List Each
\$1 35

Type R Hanger

Straight Line—750 Volts



A LIGHT weight Hanger that will take care of all ordinary conditions on city lines.

The sherardized stud is moulded into Dirigo Insulation and head of stud is effectively insulated from the shell by a disc of built-up mica.

Insulation is formed into a triple petticoat, providing long leakage path.

Diameter of shell at lower edge of skirt, $3\frac{1}{2}$ inches.

Code Word
Matronly.

No. 11593—Straight Line Hanger, Mall. Iron, Sherardized, $\frac{1}{4}$ -inch Stud...
List per 100 \$52 80

Type N Hanger

Straight Line—750 Volts



PARTICULARLY adapted for ordinary conditions on city lines. Span wire is carried below arms, while on the more common forms span wire passes above arms, causing entire load to be carried by two small lugs or clips.

Dirigo Insulation is used, and shell completely encloses it, giving protection from blows from trolley.

The forged stud is sherardized and is moulded directly into insulation, being provided with a flanged head which, together with ribs inside shell, firmly anchors parts of hanger together.

Lower end of stud is fitted with a washer which forms a broad bearing surface for boss of trolley ear or clamp and serves to reinforce the insulation.

Shell is $3\frac{1}{8}$ inches in diameter at lower edge of metal skirt.

Code Word	No.	List per 100
Adjunt.	3144—Straight Line Hanger, Mall. Iron, Sherardized, $\frac{1}{8}$ -inch Stud	\$59 40
Adjutor.	6554—	.... 61 60

Type F Hanger

Straight Line—750 Volts



SIMILAR to Type N Hanger, except larger and heavier throughout and well adapted for ordinary interurban and heavy city work. Shell is $3\frac{1}{2}$ inches in diameter at lower edge of skirt.

Code Word	No.	List per 100
<i>Adhibit.</i>	8876—Straight Line Hanger, Mall. Iron, Sherardized, $\frac{1}{2}$ -inch Stud...	\$68 20
<i>Adipose.</i>	8877— “ “ “ “ “ “ “ $\frac{1}{2}$ “ “ ...	70 40

Type L Hanger

Straight Line—750 Volts



EXTRA heavy form of round top hanger, intended for the most severe service conditions.

Diameter of skirt at lower edge is $3\frac{1}{2}$ inches.

Body and arms are heavier than those of the Type F Hanger.

Code Word	No.	List per 100
<i>Additive.</i>	5491—Straight Line Hanger, Mall. Iron, Sherardized, $\frac{1}{2}$ -inch Stud...	\$88 00
<i>Adducent.</i>	5493— “ “ “ “ “ “ “ $\frac{1}{2}$ “ “ ...	90 20

Type N Lock Hanger

Patent Applied For

Straight Line—750 Volts



POSSESSES long sought for tight aligning feature—boss of ear or clamp can be screwed up tight against bottom of Hanger and at the same time always align perfectly with trolley wire.

Prevents bending of stud and stripping of threads which sometimes occur when ordinary round top hangers are used because of the necessity of “backing-off” ear or clamp to align with trolley wire, thus leaving it loose on the stud.

Consists of a sherardized forged stud securely held in place by a malleable cup casting which is swaged upon a sherardized anchor casting; assembled unit being moulded into hanger shell with Dirigo Insulation.

Particularly adapted for ordinary conditions on city lines. Ample mechanical strength is afforded in stud to provide a large factor of safety under service conditions.

Stud is effectively prevented from rotating by lug on inside of cup casting but has a limited vertical movement in opposition to heavy lock washer as shown in cut.

Shell casting same as that used in regular Type N Hanger, span wire being carried below arms.

Insulation firmly anchored in shell which completely encloses it and protects it from blows from trolley.

Bottom of insulation moulded into double petticoat; shell $3\frac{1}{2}$ inches in diameter.

Code Word	No.	List per 100
<i>Infumate.</i>	11062—Straight Line Hanger, Mall. Iron, Sherardized, $\frac{5}{8}$ -inch Stud...	\$70 40
<i>Lexicon.</i>	11212—	... 72 60

Type F Lock Hanger

Patent Applied For

Straight Line—750 Volts



POSSESSES same tight aligning feature as Type N Lock Hanger described on preceding page.

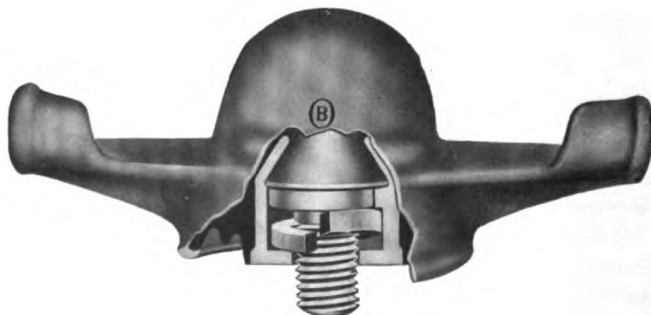
Shell is same as used in regular Type F Hanger and adapted for ordinary interurban and heavy city work, being $3\frac{1}{2}$ inches in diameter at bottom of skirt.

Code Word	No.	List per 100
<i>Infused.</i>	11064—Straight Line Hanger, Mall. Iron, Sherardized, $\frac{3}{4}$ -inch Stud..	\$79 20
<i>Libation.</i>	11213—	81 40

Type L Lock Hanger

Patent Applied For

Straight Line—750 Volts



POSSESSES same tight aligning feature as Type N Lock Hanger described on preceding page.

Extra heavy design intended for most severe service conditions.

Shell is same as used in regular Type L Hanger, being $3\frac{1}{2}$ inches in diameter at bottom of skirt.

Code Word	No.	List per 100
<i>Infuse.</i>	11063—Straight Line Hanger, Mall. Iron, Sherardized, $\frac{3}{4}$ -inch Stud..	\$99 00

Type N Hangers

Patented

Single Curve—750 Volts



BODY of hanger is similar to our Standard Type N Hanger listed on page 115 except that it is provided with a clevis. Separable arm is attached to clevis by a $\frac{7}{8}$ x $1\frac{1}{8}$ -inch blank bolt and a cotter pin.

This construction permits renewing a hanger body without detaching the arm from the span wire and also makes it possible to screw a long ear or clamp upon the hanger stud.

Distance from center of threaded stud to inside of arm is 4 inches, providing sufficient clearance for trolley wheels and harps.

Diameter of hole for strand, $\frac{1}{2}$ inch. Diameter of hanger at bottom of skirt, $3\frac{1}{8}$ inches.

Code Word	No.	List per 100
<i>Matted.</i>	11650—Hanger complete, Mall. Iron, Sher., $\frac{1}{8}$ -inch Stud.....	\$70 40
<i>Matting.</i>	11652—Hanger without Separable Arm, with Bolt and Cotter.....	59 40
<i>Mattress.</i>	11654—Separable Arm only, Mall. Iron, Sher.....	11 00

Above Hangers can be furnished to order with $\frac{3}{4}$ -inch Stud.

Type N Hangers

Patented

Double Curve—750 Volts



BODY of hanger is similar to our Standard Type N Hanger listed on page 115 except that it is provided with a clevis. Separable arms are attached to clevises by $\frac{1}{4}$ x $1\frac{1}{8}$ -inch blank bolts and cotter pins.

This construction permits renewing a hanger body without detaching the arms from the span wire and also makes it possible to screw a long ear or clamp upon the hanger stud.

Distance from center of threaded stud to inside of arms is 4 inches, providing sufficient clearance for trolley wheels and harps.

Diameter of holes for strand, $\frac{1}{2}$ inch. Diameter of hanger at bottom of skirt, $3\frac{1}{8}$ inches.

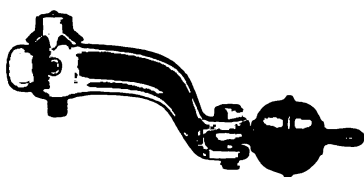
Code Word	No.	List per 100
<i>Matweed.</i>	11651—Hanger complete, Mall. Iron, Sher., $\frac{1}{4}$ -inch Stud.....	\$89 10
<i>Maudlin.</i>	11653—Hanger without Separable Arms, with Bolts and Cotters.....	67 10
<i>Mattress.</i>	11654—Separable Arm only, Mall. Iron, Sher.....	11 00

Above Hangers can be furnished to order with $\frac{3}{4}$ -inch Stud.

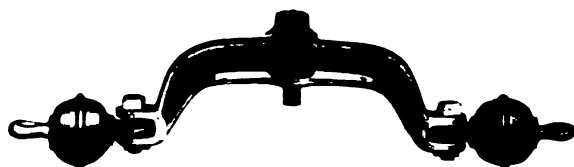
Single and Double Curve Pull-Overs

With Composition Strain Insulators—750 Volts

Type A--Form 1



Single Curve



Double Curve

MALLEABLE Iron Yoke casting has "I" section with rib at top and bottom of vertical web making it very strong.

Ample insulation is furnished by our 2 $\frac{1}{4}$ -inch Composition Strain Insulator No. 11526 attached to yoke by $\frac{7}{16}$ -inch clevis bolt and a $\frac{1}{8}$ x $\frac{3}{4}$ -inch cotter pin.

Opening in clevis is $\frac{9}{16}$ inch and will take any of our standard Composition or 1 and 1 $\frac{1}{4}$ -inch Wood Strain Insulators.

Horizontal distance between center of stud and center of clevis bolt is 6 inches and provides maximum clearance.

Single Curve Pull-Over has oblong eye $\frac{7}{16}$ x $\frac{7}{8}$ inch to which two guy wires may be attached if desired.

Cap Nut is provided with lugs, one of which should be bent down to engage a corresponding lug on yoke casting after ear or clamp has been tightened and thus prevent stud from unscrewing.

Code Word	No.		List per 100
<i>Maunder.</i>	11834—	Single Curve Pull-Over, Sherardized, $\frac{3}{4}$ x 2 $\frac{1}{4}$ -inch Stud.....	\$83 60
<i>Maurist.</i>	11835—	" " " " " " $\frac{3}{4}$ x 2 $\frac{1}{8}$ " "	88 00
<i>Mauther.</i>	11836—	Double " " " " " " $\frac{3}{4}$ x 2 $\frac{1}{4}$ " "	149 60
<i>Mawmet.</i>	11837—	" " " " " " $\frac{3}{4}$ x 2 $\frac{1}{8}$ " "	154 00

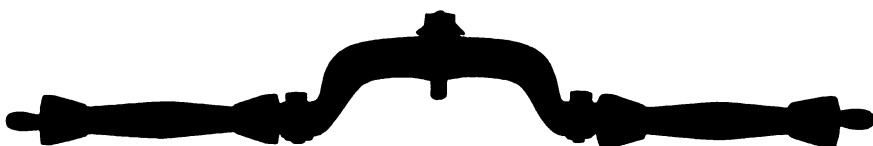
Single and Double Curve Pull-Overs

With Wood Strain Insulators—750 Volts

Type A—Form 2



Single Curve



Double Curve

EXACTLY in duplicate of Type A, Form 1 shown on preceding page with the exception that our standard Wood Strain Insulator, Number 8574, attached to the yoke by means of a $\frac{1}{8}$ -inch clevis bolt and a $\frac{1}{8}$ x $\frac{3}{4}$ -inch cotter pin, is furnished in place of Composition Strain Insulator.

Opening in clevis is $\frac{9}{16}$ -inch and will take any of our standard Composition or 1 and $1\frac{1}{4}$ -inch Wood Strain Insulators.

Horizontal distance between center of stud and center of clevis bolt is 6 inches and provides maximum clearance.

Single Curve Pull-Over has oblong eye $\frac{7}{8}$ x $\frac{7}{8}$ -inch to which two guy wires may be attached if desired.

Cap Nut is provided with lugs, one of which should be bent down to engage a corresponding lug on yoke casting after ear or clamp has been tightened up and thus prevent stud from unscrewing.

Code Word	No.	List per 100
<i>Mauseed.</i>	11838—Single Curve Pull-Over, Sherardized, $\frac{3}{4}$ x2 $\frac{1}{8}$ -inch Stud	\$ 73 90
<i>Maybird.</i>	11839—“ “ “ “ $\frac{1}{2}$ x2 $\frac{1}{8}$ “ “	79 70
<i>Mayhap.</i>	11840—Double “ “ “ “ $\frac{3}{4}$ x2 $\frac{1}{8}$ “ “	129 35
<i>Maying.</i>	11841—“ “ “ “ $\frac{1}{2}$ x2 $\frac{1}{8}$ “ “	135 15

Single and Double Curve Pull-Overs

With Wood Strain Insulators—750 Volts

Type B—Form 2



Single Curve



Double Curve

EXACTLY in duplicate of Form 1 shown on preceding page, with exception that our standard Wood Strain Insulator, Number 8574, attached to the yoke by means of a $\frac{1}{8}$ -inch clevis bolt and a $\frac{1}{4} \times \frac{3}{4}$ -inch cotter pin, is furnished in place of Composition Strain Insulator.

Opening in clevis is $\frac{3}{16}$ inch and will take any of our standard Composition or 1 and $1\frac{1}{2}$ -inch Wood Strain Insulators.

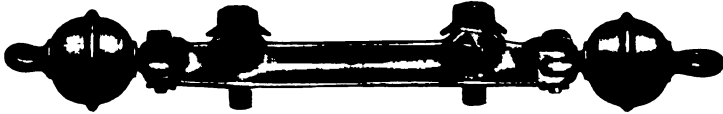
Horizontal distance between center of stud and center of clevis bolt is $4\frac{1}{2}$ inches.

Single Curve Pull-Over has oblong eye $\frac{1}{8} \times \frac{3}{4}$ inch to which two guy wires may be attached if desired.

Cap Nut is provided with lugs, one of which should be bent down to engage a corresponding lug on yoke casting after ear or clamp has been tightened up, and thus prevent stud from unscrewing.

Code Word	No.	List per 100
<i>A flame.</i>	8888—Single Curve Pull-Over, Sherardized, $\frac{1}{2} \times 1\frac{1}{2}$ -inch Studs.....	\$112 20
<i>A float.</i>	8889—“ “ “ “ “ “ $\frac{1}{2} \times 1\frac{1}{2}$ “ “	122 00
<i>Aggregate.</i>	8892—Double “ “ “ “ “ “ $\frac{1}{2} \times 1\frac{1}{2}$ “ “	167 20
<i>Aghast.</i>	8893—“ “ “ “ “ “ $\frac{1}{2} \times 1\frac{1}{2}$ “ “	176 00

Type B—Form 1—750 Volts



Opening in clevis is $\frac{9}{16}$ inch.

Code Word	No.	List per 100
<i>Mazurka.</i>	11846—Suspension, Mall. Iron, Sherardized, $\frac{3}{4} \times 1\frac{1}{2}$ -inch Stud.....	\$165 00
<i>Meadow.</i>	11847—“ “ “ “ “ “ $\frac{3}{4} \times 1\frac{1}{2}$ “ “	169 40



Code Word	No.	List per 100
<i>Agitable.</i>	8674—Cap Nut only, $\frac{1}{2}$ inch, Sherardized	\$ 5 50
<i>Agnostic.</i>	8910—“ “ “ “ “ “	7 70
<i>Aidance.</i>	8672—Stud only, $\frac{1}{2}$ x 1 inches, Sherardized	4 40
<i>Ailment.</i>	8909—“ “ “ “ “ “	5 50
<i>Aimless.</i>	10447—“ “ “ x2 $\frac{1}{2}$ “ “	5 50
<i>Alacrity.</i>	10448—“ “ “ x2 $\frac{1}{2}$ “ “	6 00

In ordering Studs care should be taken to ascertain that the Studs specified are of the proper length to fit the Pull-Over's or Yokes with which they are to be used. Length of Stud used will be found in the listing of each device.

Universal Mine Hanger

Form 1—550 Volts



USED for insulating trolley wires in mines and may be attached either directly to mine roof or to roof timbers, thus obviating necessity of carrying a stock of two kinds of hangers at the mine.

Broad bearing surface at top makes hanger very rigid when installed. This feature is particularly desirable on curve work.

A hex for application of wrench to body of Hanger makes installation a simple matter.

Sherardized stud bolt is moulded into shell with Dirigo Insulation and head of bolt is effectively insulated from shell by a disc of built-up mica. Lower surface of insulation is moulded into a triple petticoat which prevents surface leakage in wet mines. Two holes in body drain water from inside of upper portion.

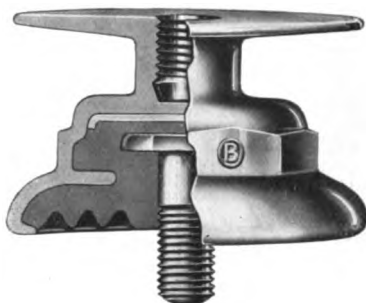
May be attached directly to the mine roof by means of Type A, Form 3, Expansion Bolt; Type C, Form 1, Expansion Bolt; or Mine Hanger Screw and Wood Plug. For applying to roof timbers, the Mine Hanger Screw only is necessary.

Height, top of ear boss to top of flange.....	2	inches
Diameter of Hanger.....	3 $\frac{5}{8}$	"
Hole in boss tapped for bolt.....	$\frac{5}{8}$	"

Code Word	No.	List per 100
<i>Judaize.</i>	11309—Mine Hanger, Malleable Iron, Sherardized, $\frac{5}{8}$ -inch Stud.....	\$68 20
<i>Amender.</i>	9993—Hanger Wrench, Malleable Iron, Japanned.....	55 00

Universal Mine Hanger

Form 2—550 Volts



USED for insulating trolley wires in mines and may be attached either directly to mine roof or to roof timbers, thus obviating necessity of carrying a stock of two kinds of hangers at the mine.

Broad bearing surface at top makes hanger very rigid when installed. This feature is particularly desirable on curve work.

A hex for application of wrench to body of Hanger makes installation a simple matter.

Sherardized stud bolt is moulded into shell with Dirigo Insulation and head of bolt is effectively insulated from shell by a disc of built-up mica. Lower surface of insulation is moulded into a triple petticoat which prevents surface leakage in wet mines.

May be attached directly to the mine roof by means of Type A, Form 3, Expansion Bolt; Type C, Form 1, Expansion Bolt; or Mine Hanger Screw and Wood Plug. For applying to roof timbers, the Mine Hanger Screw only is necessary.

Height, top of ear boss to top of flange.....	2 $\frac{1}{8}$ inches
Diameter of Hanger.....	3 $\frac{1}{2}$ "
Hole in boss tapped for bolt.....	$\frac{5}{8}$ "

Code Word
Mealies.
Mealzing.

No.	List per 100
11907—Mine Hanger, Malleable Iron, Sherardized, $\frac{1}{4}$ -inch Stud..	\$55 00
11555—Hanger Wrench, Malleable Iron, Japanned.....	44 00

Type H Mine Hanger

Form 1—550 Volts



USED for insulating trolley wires in mines and is designed for attachment direct to mine timbers.

Double skirt prevents surface leakage and makes hanger particularly suitable for wet mines.

Outer shell of malleable iron contains sherardized stud bolt and Dirigo Insulation, which are moulded into shell under hydraulic pressure.

Stud is threaded at lower end to engage threaded boss of trolley ear or clamp, upper end being headed to secure a firm hold in insulation.

Top of stud bolt is very effectively insulated from inside of hanger casting by a disc of built-up mica.

Hanger shell is provided on inner surface with a circular flange and also with a tip at lower edge of skirt, which secure insulation in shell.

Two horizontal lugs extend out from top of shell for attaching Hanger to roof timbers with $\frac{1}{2}$ -inch lag screws. Lugs project far enough so that skirt does not interfere with lag screws when installing.

Height, top of ear boss to top of hanger shell.....	$1\frac{5}{8}$	inches
Diameter of Hanger.....	$3\frac{5}{8}$	"
" hole and slot in lugs.....	$\frac{9}{16}$	"
Distance between centers, lag screws (minimum).....	5	"

Code Word
Amplify.

No.
9959—Mine Hanger, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Stud....\$66 00

List per 100

Type H Mine Hanger

Form 2—550 Volts



USED for insulating trolley wires in mines, and is similar to Form 1 Hanger listed on preceding page, except that it is smaller.

Minimum height has been secured without detracting from its electrical and mechanical efficiency; all good features of popular Type H, Form 1, Hanger having been retained.

Sherardized stud bolt is moulded into shell with Dirigo Insulation and head of bolt is effectively insulated from shell by a disc of built-up mica, while lower surface of insulation is moulded into a double petticoat which prevents surface leakage in wet mines.

Designed for attachment to roof timbers by means of two $\frac{1}{2}$ -inch lag screws.

Note that both lugs project far enough so that skirt does not interfere with lags in installing, also that both lugs are slotted so that both lag screws can be well started into wood before hanger is placed on them—a big convenience.

Height, top of ear boss to top of hanger shell.....	$1\frac{1}{2}$	inches
Diameter of Hanger	$3\frac{1}{4}$	"
Width of slots in lugs.....	$\frac{9}{16}$	"
Distance between centers lag screws (minimum).....	$4\frac{1}{2}$	"

Code Word
Hauberk.

No.
10603—Mine Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud....

List per 100

\$55 00

Type H Mine Hanger

Form 3—550 Volts



USED for insulating trolley wires in mines and is similar to the Type H, Form 2 Hanger listed on preceding page, except that it is lower in height and lighter in weight.

Designed for attachment to roof timbers by means of two $\frac{1}{2}$ -inch lag screws.

Sherardized stud bolt is moulded into shell with Dirigo Insulation and head of bolt is effectively insulated from shell by a disc of built-up mica, while lower surface of insulation is moulded into a triple petticoat which prevents surface leakage in wet mines.

Note that both lugs project far enough so that skirt does not interfere with lags in installing, also that lugs are slotted so that both lag screws can be well started into wood before hanger is placed on them—a big convenience.

Height, top of ear boss to top of hanger shell.....	$1\frac{5}{16}$	inches
Diameter of Hanger.....	$3\frac{1}{2}$	"
Width of slots in lugs.....	$\frac{9}{16}$	"
Distance between centers lag screws (minimum).....	$4\frac{1}{2}$	"

Code Word
Meander.

No. 11553—Mine Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud... List per 100 \$48 40

Type K Mine Hanger

Form 1—550 Volts



USED for insulating trolley wires in mines and is designed for attachment direct to mine roof by means of an expansion bolt or a similar fastening.

Mica is used to insulate top of sherardized stud bolt from malleable iron hanger casting, and lower surface of Dirigo Insulation is moulded into a double petticoat which prevents tendency to surface leakage in wet mines.

Flanged top presents a broad bearing, making Hanger, when installed, one of the most rigid and secure on the market. This feature is especially valuable on curve work.

Very easy and convenient to install, due to two flat surfaces under the flange, which provide ample means for application of wrench.

May be attached directly to the mine roof by means of the Type A, Form 3, Expansion Bolt; Type C, Form 1, Expansion Bolt; or Mine Hanger Screw and Wood Plug.

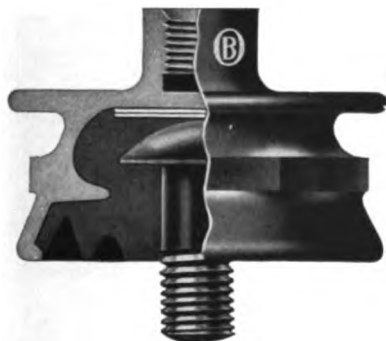
For applying to roof timbers, the Mine Hanger Screw only is necessary.

Height, top of ear boss to top of flange.....	1 $\frac{5}{8}$ inches
Diameter of hanger	3 $\frac{5}{8}$ "
Hole in top boss tapped for bolt.....	$\frac{5}{8}$ "

Code Word	No.	List per 100
<i>Ambush.</i>	9975—Mine Hanger, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Stud.....	\$66 00
<i>Amender.</i>	9993—Hanger Wrench, Malleable Iron, Japanned.....	55 00

Type K Mine Hanger

Form 2—550 Volts



USED for insulating trolley wires in mines, and is similar to Form 1 Hanger listed on preceding page except that it is smaller. Minimum height has been secured without detracting from its electrical and mechanical efficiency, all good features of popular Type K, Form 1, Hanger having been retained.

Sherardized stud bolt is moulded into shell with Dirigo Insulation and head of bolt is effectively insulated from shell by a disc of built-up mica, while lower surface of Dirigo Insulation is moulded into a double petticoat which prevents surface leakage in wet mines.

Flanged top presents a broad bearing, making Hanger very rigid when installed. This feature is especially valuable on curve work.

Very easy and convenient to install due to a hex under the flange which provides means for application of wrench.

May be attached directly to mine roof by means of Type A, Form 3, Expansion Bolt, Type C, Form 1, Expansion Bolt or Mine Hanger Screw and Wood Plug. For applying to roof timbers, the Mine Hanger Screw only is necessary.

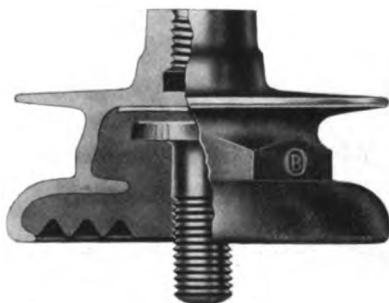
Height, top of ear boss to top of flange.....	1½ inches
Diameter of Hanger.....	3¼ "
Hole in boss tapped for bolt.....	⅝ "

Code Word
Haugh.
Hauler.

No.	List per 100
10602—Mine Hanger, Malleable Iron, Sherardized, ⅝-inch stud.....	\$55 00
10604—Hanger Wrench, Malleable Iron, Japanned.....	44 00

Type K Mine Hanger

Form 3—550 Volts,



USED for insulating trolley wires in mines, and is similar to Form 2 Hanger listed on preceding page except that it is lower in height and lighter in weight. Minimum height has been secured without detracting from its electrical and mechanical efficiency.

Sherardized stud bolt is moulded into shell with Dirigo Insulation and head of bolt is effectively insulated from shell by a disc of built-up mica, while lower surface of Dirigo Insulation is moulded into a triple petticoat which prevents surface leakage in wet mines.

Flanged top presents a broad bearing, making Hanger very rigid when installed. This feature is especially valuable on curve work.

Very easy and convenient to install due to a hex under the flange which provides means for application of wrench.

May be attached directly to mine roof by means of Type A, Form 3, Expansion Bolt, Type C, Form 1, Expansion Bolt or Mine Hanger Screw and Wood Plug. For applying to roof timbers, the Mine Hanger Screw only is necessary.

Height, top of ear boss to top of flange.....	$1\frac{1}{16}$ inches
Diameter of Hanger.....	$3\frac{1}{2}$ "
Hole in boss tapped for bolt.....	$\frac{1}{2}$ "

Code Word
Mealless.
Mealzing.

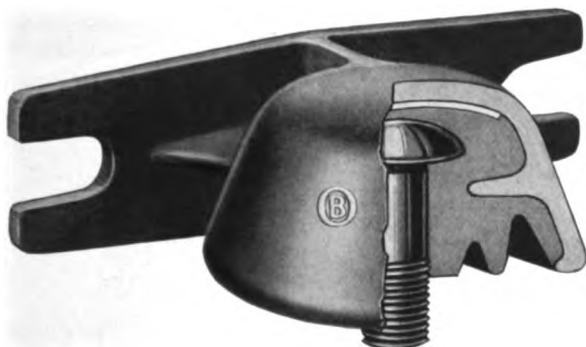
No.

11554—Mine Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud... \$48 40
11555—Hanger Wrench, Malleable Iron, Japanned..... 44 00

List per 100

Type P Mine Hanger

550 Volts



THIS is a new and original design of Hanger for insulating trolley wires in mines, and is particularly desirable in low vein mines where it is necessary to place trolley wire as close to roof as possible.

Attached to side of roof timber by means of two $\frac{1}{4}$ -inch lag screws in such a position that bottom of insulation is flush with bottom of roof timber, thus raising trolley wire from $1\frac{1}{2}$ to 2 inches higher than when ordinary type of hanger, fastened to bottom of timber, is used.

Note that both lugs project far enough so that skirt does not interfere with lags in installing, also that both lugs are slotted so that both lag screws can be well started into wood before Hanger is placed on them.

Sherardized stud bolt is moulded into shell with Dirigo Insulation and head of bolt is effectively insulated from shell by a disc of built-up mica, while lower surface of insulation is moulded into a double petticoat which prevents surface leakage in wet mines.

Height, top of ear boss to top of hanger shell.....	$1\frac{1}{8}$ inches
Diameter of Hanger.....	$3\frac{1}{4}$ "
Width of slots in lugs.....	$\frac{9}{16}$ "
Distance between centers lag screws (minimum).....	$4\frac{1}{2}$ "

Code Word
Inutile.

No. 11032—Mine Hanger, Malleable Iron, Sherardized, $\frac{1}{4}$ -inch Stud....

List per 100

\$66 00

Standard Mine Hanger

550 Volts



USED for insulating trolley wire in mines and attached to roof timbers by means of $\frac{1}{2}$ -inch lag screws.

Consists of a sherardized, malleable iron shell into which is screwed a Dirigo insulator with a sherardized forged stud moulded into it.

A space is provided between insulation and interior wall of iron shell.

Insulated portion can be renewed, if desired, without taking down hanger shell.

Shell protects insulation from blows of trolley wheel and from moisture dripping down in wet mines.

Space between insulation and shell prevents deposit of a conducting layer forming across bottom face of insulator to stud bolt.

Height, top of ear boss to top of hanger shell.....	2 $\frac{1}{2}$ inches
Diameter of hanger.....	3 $\frac{1}{4}$ "
Diameter of hole and slot in lugs.....	$\frac{5}{8}$ "
Distance between centers lag screws (minimum).....	4 $\frac{7}{8}$ "

Code Word
Amputate.

No.
1080—Mine Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud. . . . \$77 00

List per 100

Type B Mine Hanger

550 Volts



USED for insulating trolley wire in mines and attached directly to mine roof by expansion bolt or similar device.

Dirigo Insulation and sherardized forged stud are moulded directly into sherardized malleable iron hanger casting.

Upper end of stud bolt is provided with flange head which, together with inner ribs of body casting, anchors bolt firmly in shell.

May be attached to mine roof by Type A—Form 2 Expansion bolt.

Height, top of ear boss to top of hanger boss.....	3 inches
Diameter of hanger.....	3 "
Hole in boss tapped for bolt.....	$\frac{5}{8}$ "

Code Word	No.	List per 100
Amusable.	5784—Mine Hanger, Malleable Iron, Sherardized, $\frac{5}{8}$ -inch Stud.....	\$61 60

Type G Mine Hanger

550 Volts



USED for insulating trolley wire in mines and arranged for attachment directly to roof of mine.

Consists of heavy malleable iron body casting, sherardized, and Type G Insulator Cap and Cone.

May be attached to mine roof by Type A—Form 1 or Type C—Form 2 Expansion Bolts.

Height, top of ear boss to top of hanger casting.....	4½ inches
Largest diameter of hanger.....	5 "
Diameter of insulating cap.....	3½ "
Diameter of hole in top of hanger casting.....	¾ "

Code Word	No.	List per 100
<i>Analogue.</i>	5777—Mine Hanger, Mall. Iron, Sher., ½-inch Stud, Plain Cone.....	\$78 10
<i>Analogy.</i>	5778— " " " " " Lock ".....	80 30

For description and advantages of Lock Cone, see page 106.

Jamme Mine Hanger

Patented

Form 1—550 Volts



USED for insulating trolley wires in mines and is attached directly to mine roof. Consists of a malleable iron body casting, into which is screwed a renewable Dirigo insulator. A space between insulation and interior wall of shell prevents deposit of a conducting layer forming across bottom of insulator to stud.

Provided with a slotted shell fitted with a wood plug for expanding upper end of shell as it is driven into position in a hole of proper size bored in mine roof.

Height, top of ear boss to top of hanger casting	2½ inches
Diameter of hanger	3½ "
Length of expansion shell from top of hanger boss	5½ "
Diameter of expansion shell	1½ "
Hanger tapped for standard iron pipe	¾ "

Code Word	No.	List per 100
<i>Ambulant.</i>	9230—Mine Hanger, Malleable Iron, Sherardized, ½-inch Stud	\$99 00

Where it is desired to use a suspension longer than 5½ inches we can supply to order slotted pieces of pipe cut to any desired length in place of expansion shell.

Jamme Mine Hanger

Patented

Form 2—550 Volts



USED for insulating trolley wires in mines and is attached directly to mine roof.

Sherardized forged stud bolt and Dirigo Insulation are moulded directly into hanger casting, and top of stud bolt is effectively insulated from hanger casting by a disc of built-up mica.

Method of attachment consists of drilling a hole of proper diameter and depth in mine roof and then driving expansion shell with its taper plug upward, the plug striking against bottom of hole and forcing sides of shell outward, firmly wedging it in position.

Height, top of ear boss to top of hanger casting	2 $\frac{1}{4}$ inches
Diameter of hanger	3 $\frac{5}{8}$ "
Length of expansion shell from top of hanger boss	5 $\frac{1}{2}$ "
Diameter of expansion shell	1 $\frac{1}{4}$ "
Hanger tapped for standard iron pipe	$\frac{3}{4}$ "

Code Word	No.	List per 100
Amiable.	9994—Mine Hanger, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Stud.	\$88 00

Where it is desired to use a suspension longer than 5 $\frac{1}{2}$ inches we can supply to order slotted pieces of pipe cut to any desired length in place of the expansion shell.

Combination Pipe Adaptor



USED for attaching mine hangers to horizontal or vertical pipe. Will fit a $1\frac{1}{4}$ -inch standard pipe fastened vertically into the roof or a $1\frac{1}{2}$ -inch standard pipe suspended horizontally from a side wall or used as a bracket arm in outside construction.

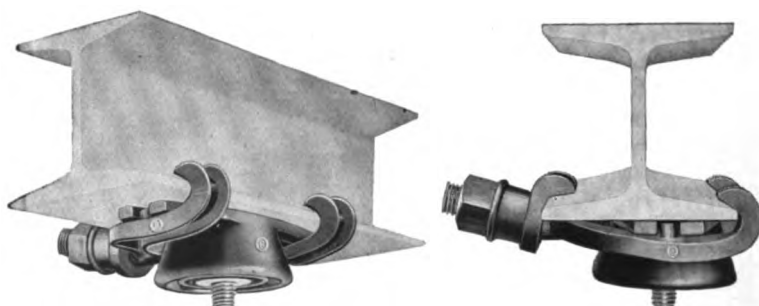
Is fastened to pipe by tightening nuts on the two bolts which hold the castings together. Provided with a $\frac{3}{8}$ -inch stud for attaching hanger.

Code Word	No.	List per 100
<i>Meconate.</i>	11848—Adaptor, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Stud	\$41 00

I-Beam Clamp



I-Beam Clamp



Showing Mine Hanger Installed with I-Beam Clamp

OFFERS a very convenient and efficient means of attaching mine timber hangers to steel I-Beam roof supports in mines.

Very quickly installed by hooking over edges of flange of beam and tightening nut, two lugs on Clamp fitting into slots or holes in arms of hanger and holding latter firmly in place as shown in illustrations.

Number 11236 will fit any 5 to 8-inch I-Beam having a flange not less than 3 nor more than $4\frac{1}{2}$ inches wide.

Number 10980 will fit any 8 to 12-inch I-Beam having a flange not less than 4 nor more than $5\frac{1}{4}$ inches wide.

Either Clamp can be used with the Type H, Forms 1, 2 and 3, and Standard Mine Hangers.

Code Word	No.	List per 100
<i>Junket.</i>	11236—Clamp for 5 to 8-inch I-Beams, inclusive.....	\$35 20
<i>Infusion.</i>	10980—“ 8 to 12 “ “ “	44 00

Type A Expansion Bolts



Form 1 Bolt—For use with Type G Hanger



Form 2 Bolt—For use with Type B Hanger



Form 3 Bolt—For use with Type K, Forms 1, 2 and 3, and Universal Hangers

USED for attaching mine hangers direct to mine roof.

Consists of a malleable iron shell, $1\frac{1}{4}$ inches in diameter, fitted with an internal stud bolt and cone-shaped nut, which expands shell and draws hanger up tightly against roof.

Serrations prevent shell from turning during installation.

Form 1 Bolt is used with Type G Hanger.

Form 2 Bolt is fitted with a washer 3 inches in diameter, which gives a good bearing surface against the roof, and a hex is provided on stud so shell can be expanded before hanger is attached.

Form 3 Bolt is used with the Universal and Type K Hangers, and is furnished without a washer as flange on these hangers provides ample bearing surface against roof.

Form 1 Bolt

Code Word	No.		List per 100
Anarch.	5773	Form 1 Bolt, Sherardized, length of Shell 4 inches, $\frac{1}{8}$ -inch Stud	\$25 40
Anatine.	5774	" 1 " " 6 " " " "	33 50

Form 2 Bolt

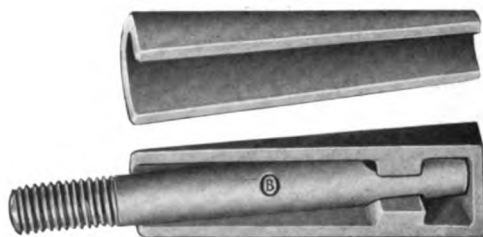
Anatomy.	5775	Form 2 Bolt, Sherardized, length of Shell 4 inches, $\frac{1}{8}$ -inch Stud	34 65
Ancestor.	5776	" 2 " " " 6 " " " "	38 10

Form 3 Bolt

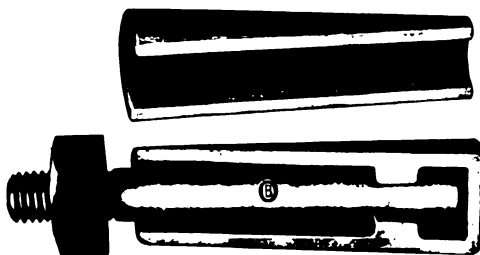
Aneroid.	10072	Form 3 Bolt, Sherardized, length of Shell 4 inches, $\frac{1}{8}$ -inch Stud	23 10
Ancient.	10073	" 3 " " " 6 " " " "	27 75

Type C Expansion Bolt

Forms 1 and 2



Form 1—No. 9540



Form 2—No. 10458

FORM 1 Bolt is used with Type K, Forms 1, 2 and 3, and Universal Hangers.

Form 2 Bolt is provided with a nut for use with Type G Hangers.

To install Bolt a $1\frac{1}{4}$ -inch hole is drilled in mine roof. The half of shell engaging with stud is inserted in the hole together with stud and the other half of shell is driven up into place, causing bolt to firmly grip sides of hole. Hanger may then be attached to stud.

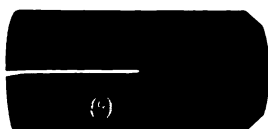
Stud is prevented from turning by lugs in shell which fit into slots in stud.

Length of shell 4 inches.

Code Word
Camerate.
Camper.

No.	List per 100
9540—Form 1 Bolt, Sherardized, $\frac{3}{8}$ -inch forged Stud.....	\$22 50
10458— " 2 " with Nut, Sherardized, $\frac{3}{8}$ -inch forged Stud...	24 95

Mine Hanger Screw and Wood Plug



No. 8770



No. 8771

THIS combination affords a convenient and economical means for attaching Type K, Forms 1, 2 and 3, and Universal Hangers directly to mine roof.

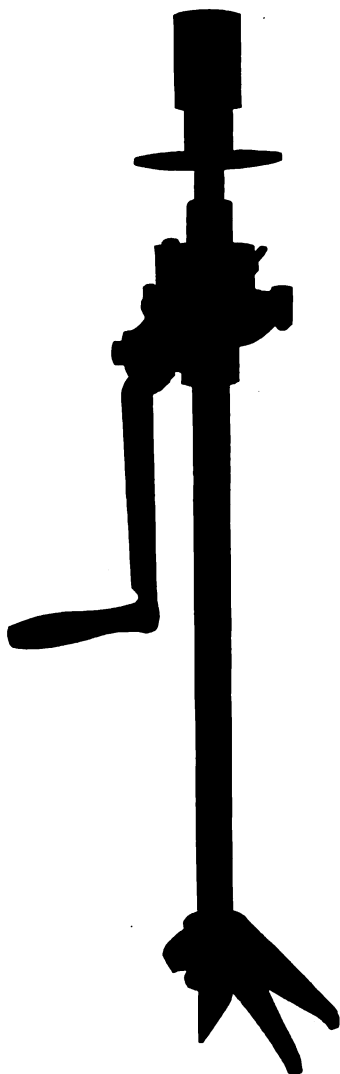
A hole is drilled in roof of such a size that wood plug will make a driving fit. Hanger screw is then attached to mine hanger and is screwed into wood plug by means of a wrench, thereby expanding the wood plug.

When hanger is to be attached to roof timbers, mine hanger screw only is necessary.

Wood plug is slotted on both sides, making it easy to start lag screw in it.

Code Word	No.	List per 100
<i>Animate.</i>	8770—Wood Plug, Japanned, 1½x4 inches.....	\$4 40
<i>Annoint.</i>	8771—Lag Screw Support, Sherardized, ½x5 inches.....	6 60

Self-Feeding Mine Drill



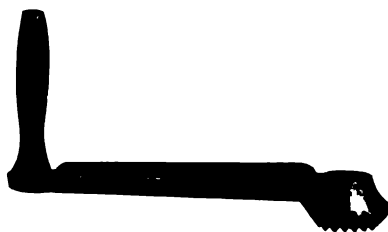
Drill, Nos. 8218-10693



Feed Shaft Gear No. 8736



Split Feed Nut, Nos. 8733-10694



Handle Gear No. 8734



Auger Bits, Nos. 8219-8224

See following page for description and listing.

Self-Feeding Mine Drill—*Continued*

DESIGNED especially for drilling holes in mine roofs and walls, for installing hangers, as well as for blasting purposes, etc.

Can be anchored at lower end either against ground or a projecting ledge in wall, or both, as desired, by properly adjusting movable brace on pipe standard.

Auger is operated by a crank which feeds the Drill automatically.

Drill can be quickly set up or removed by loosening clamping piece bearing against feed screw, allowing screw to drop back in pipe standard.

Perfect lubrication can be assured by keeping pipe standard filled with oil. Leather washer prevents dirt from falling into gears.

Form 1 Drill is recommended in all cases except where roof or wall is extremely hard, when Form 2 Drill, with slower feed, should be used.

Drills differ only in Split Bronze Feed Nut and Threaded Feed Shaft, both of which are threaded 14 threads per inch in Form 1 and 18 threads per inch in Form 2.

Drill may be converted from fast feed to slow feed or vice versa by simply changing these two parts.

Minimum height from bottom of pipe standard to top of drill chuck is 51½ inches; maximum height is 86½ inches.

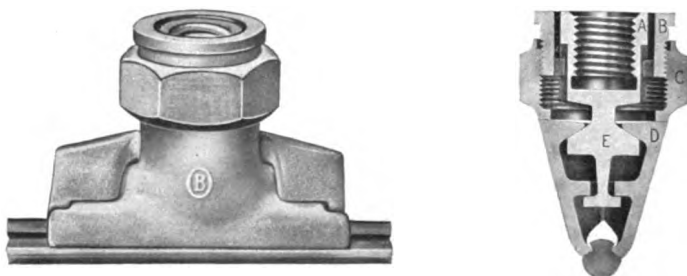
Hole in chuck is ¾ x 1½ inches and 2½ inches deep.

Code Word	No.	List Each
<i>Annuary.</i>	8218—Self-Feeding Mine Drill, Form 1 (Fast Feed).....	\$35 20
<i>Haunch.</i>	10693— " " " " 2 (Slow ").....	35 20
<i>Antedate.</i>	8733—Split Bronze Feed Nut for Form 1 Drill, 14 threads per inch..	5 50
<i>Haunched.</i>	10694— " " " " 2 " 18 " ..	5 50
<i>Anthem.</i>	8735—Threaded Feed Shaft, for Form 1 Drill, Catalog No. 8218.	9 00
<i>Haunt.</i>	10695— " " " " 2 " 10693.	9 00
<i>Antelope.</i>	8734—Handle Gear, Steel, 18 Teeth, for Forms 1 and 2 Drills.	3 65
<i>Antic.</i>	8736—Feed Shaft Gear, Steel, 28 Teeth, for Forms 1 and 2 Drills.	4 40
<i>Infusive.</i>	11015—Bit Chuck, Malleable Iron, for Form 1 Drill.	1 65
<i>Ingate.</i>	11016— " " " " 2 " ..	1 65
<i>Antimony.</i>	8219—Auger Bits, 1½ inches in diameter, 12 inches long.	2 20
<i>Antique.</i>	8220— " 1½ " " 12 " ..	2 30
<i>Antler.</i>	8221— " 1½ " " 24 " ..	3 45
<i>Apace.</i>	8222— " 1½ " " 24 " ..	3 70
<i>Apathy.</i>	8223— " 1½ " " 36 " ..	4 40
<i>Apical.</i>	8224— " 1½ " " 36 " ..	4 95

New Modoc Trolley Clamp

Form 1—Patented

For Round, Figure 8 and Grooved Wires



THIS Clamp is especially designed for supporting trolley wires in mines. In installing, Clamp is first screwed upon hanger stud until suspension casting (A) comes in contact with hanger and is then backed off sufficiently to align Clamp with trolley wire. Operating nut (C) is then run down on sleeve casting (B) and, coming in contact with tops of jaw castings (D) it forces sleeve (B) upward, making a tight and rigid joint between Clamp and insulation on bottom of hanger and forces jaw castings (D) downward on inverted wedge (E) of suspension casting, causing tops of jaws to be forced apart and exerting a very powerful leverage or gripping upon trolley wire.

It is possible to attach Clamp to trolley wire just tight enough to hold wire in position until it has been stretched.

Clamp can then, by one operation, be permanently tightened upon trolley wire and hanger, thus eliminating loose joints between Clamp and hanger which it is often impossible to do with other styles of clamps.

Has no pins or weak parts and as jaws are very narrow it provides ample clearance for flange of trolley wheel.

Height overall, $2\frac{1}{4}$ inches; length of jaws $3\frac{1}{8}$ inches.

Code Word	No.	List per 100
<i>Ingeny.</i>	10875—Clamp, Form 1, Malleable Iron, Sherardized, $\frac{1}{8}$ -inch Boss, for 0 and 2-0 Round Wire.....	\$39 60
<i>Ingraft.</i>	10876—Clamp, Form 1, Malleable Iron, Sherardized, $\frac{1}{8}$ -inch Boss, for 3-0 and 4-0 Round Wire.....	39 60
<i>Ingress.</i>	10877—Clamp, Form 1, Malleable Iron, Sherardized, $\frac{1}{8}$ -inch Boss, for 0 to 4-0 Fig. 8 Wire.....	39 60
<i>Hautein.</i>	10760—Clamp, Form 1, Malleable Iron, Sherardized, $\frac{1}{8}$ -inch Boss, for 0 to 4-0 Grooved Wire.....	39 60

New Modoc Trolley Clamp

Form 2—Patented

For Round, Figure 8 and Grooved Wires



USED for supporting trolley wires in mines. Similar to Form 1 Clamp listed on the preceding page in both design and operating principle, except that Form 2 Clamp is without aligning feature and is, therefore, best adapted for use with hangers that are attached to the mine roof by means of expansion bolts, etc.

In installing, Clamp is first screwed onto stud of hanger and operating nut (B) is then run down on suspension casting (A) forcing jaw castings (C) downward on inverted wedge (D), on suspension casting, forcing tops of jaw castings apart and exerting a very powerful leverage upon trolley wire.

Clamp can be tightened on trolley wire just tight enough to hold it until wire has been stretched, after which it can be easily tightened permanently upon wire.

Has no pins or other weak parts, and as jaws are very narrow, it provides ample clearance for all trolley wheels.

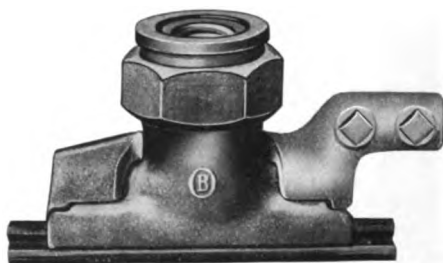
Height overall, $2\frac{1}{4}$ inches; length of jaws $3\frac{1}{8}$ inches.

Code Word	No.	List per 100
<i>Inhabile.</i>	10967—Clamp, Form 2, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Boss, for 0 and 2-0 Round Wire.....	\$33 00
<i>Inhabil.</i>	10968—Clamp, Form 2, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Boss, for 3-0 and 4-0 Round Wire.....	33 00
<i>Inhalent.</i>	10966—Clamp, Form 2, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Boss, for 0 to 4-0 Fig. 8 Wire.....	33 00
<i>Inhaler.</i>	10965—Clamp, Form 2, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Boss, for 0 to 4-0 Grooved Wire.....	33 00

New Modoc Feeder Clamp

Form 1—Patented

For Figure 8 and Grooved Wires

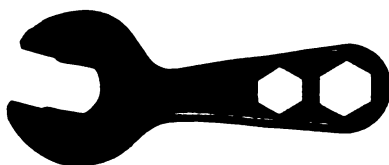


SAME design as Form 1 Clamp listed on page 148 with the addition of a horizontal feeder lug drilled for a 2-0 to 4-0 B. & S. solid or stranded wire which is held firmly in place by two set screws.

Jaw castings are made of bronze and other parts of malleable iron, sherardized.

Code Word	No.	List per 100
<i>Inherit.</i>	11018—Feeder Clamp, Bronze Jaws, $\frac{1}{2}$ -inch Boss, for 0 to 4-0 Fig. 8 Wire.....	\$77 00
<i>Inhesion.</i>	11019—Feeder Clamp, Bronze Jaws, $\frac{1}{2}$ -inch Boss, for 0 to 4-0 Grooved Wire.....	77 00

Wrench for Mine Clamps



USED for installing I-Beam Clamps, and New Modoc or Bulldog Trolley Clamps. Made of malleable iron, sherardized.

Code Word	No.	List per 100
<i>Hausen.</i>	10616—Wrench, Malleable Iron, Sherardized.....	\$44 00

Bulldog Trolley Clamp

Patented

For Round, Figure 8 and Grooved Wires



THIS design of Bulldog Clamp is especially adapted for supporting trolley wires in mines.

Consists of two substantial jaws with their upper portions interlocking and held together by a high strength steel rivet, upon which the jaws have a hinge action, clamping upon the wire by means of a yoke casting which is forced down upon them by a hex nut threaded on outside of boss.

Clamps for Round Wire as listed below are malleable iron, sherardized, except jaws which are bronze.

Clamp for Fig. 8 and Grooved Wires is malleable iron throughout, sherardized.

It is possible to attach Clamp to trolley wire just tight enough to hold wire in position until it has been stretched, after which Clamp can be tightened permanently.

Height overall $2\frac{1}{2}$ inches; length of jaws 3 inches.

Code Word	No	List per 100
<i>Arduous.</i>	10344—Clamp, Malleable Iron, Sherardized, Bronze Jaws, $\frac{1}{2}$ -inch Boss, for 0 and 2-0 Round Wire.....	\$48 40
<i>Argosy.</i>	10345—Clamp, Malleable Iron, Sherardized, Bronze Jaws, $\frac{1}{2}$ -inch Boss, for 3-0 and 4-0 Round Wire.....	50 60
<i>Arcades.</i>	10340—Clamp, Malleable Iron, Sherardized, $\frac{1}{2}$ -inch Boss, for 0 to 4-0 Fig. 8 and Grooved Wire.....	39 60

Bulldog Feeder Clamp

Patented



EXACTLY in duplicate of one listed on preceding page with addition of a feeder lug which will accommodate a No. 2-0 to 4-0 B. & S. solid or stranded feeder wire.

Height overall $2\frac{1}{8}$ inches.

Code Word	No.	List per 100
<i>Aridity.</i>	10347—Feeder Clamp, Bronze, $\frac{1}{8}$ -inch Boss, for 0 and 2-0 Round Wire	\$83 60
<i>Armament.</i>	10348—Feeder Clamp, Bronze, $\frac{1}{8}$ -inch Boss, for 3-0 and 4-0 Round Wire	83 60
<i>Arguer.</i>	10346—Feeder Clamp, Bronze, $\frac{1}{8}$ -inch Boss, for 0 to 4-0 Fig. 8 and Grooved Wires	83 60

Type M-W Feeder Clamp

Patented



EXACTLY in duplicate of one listed on following page with addition of a feeder lug which will accommodate a No. 2-0 to 4-0 B. & S. solid or stranded wire.

Height overall, $2\frac{3}{4}$ inches.

Code Word	No.	List per 100
<i>Aquarium.</i>	10428—Feeder Clamp, Bronze, 0 and 2-0 Round Wire	\$88 00
<i>Aqueduct.</i>	10429—“ “ “ 3-0 “ 4-0 “ “	92 40
<i>Arbiter.</i>	10430—“ “ “ 0, 2-0, 3-0 and 4-0 Fig. 8 Wire	92 40
<i>Arborist.</i>	10431—“ “ “ 2-0, 3-0 and 4-0 Grooved Wire	92 40

Type M-W Trolley Clamp

Patented

For Round, Figure 8 and Grooved Wires



USED for supporting trolley wires in both electric railway and mine construction. Consists of two interlocking jaws which are hinged on a steel pin which passes through lower end of stud bolt, securing the latter in place and preventing it from turning.

Provided with a special nut, cone-shaped on one end to correspond to a recess on top of Clamp, and hexagonal on other end so that the Type D Wrench may be used on it.

Stud bolt in Clamp has a left-hand thread, while thread on hexagonal end of nut is right-hand, thus allowing Clamp to be either loosened or tightened on wire by simply turning nut in proper direction.

It may be used with any hanger having a $\frac{5}{8}$ -inch stud. Height overall is $2\frac{3}{4}$ inches and the length of jaws is $4\frac{3}{8}$ inches.

Code Word	No.	List per 100
<i>Apposer.</i>	10422—Clamp, Bronze, for 0 and 2-0 Round Wire.....	\$72 60
<i>Apprizer.</i>	10423— “ “ 3-0 “ 4-0 “ “	74 80
<i>Apricot.</i>	10424— “ “ 0, 2-0, 3-0 and 4-0 Fig. 8 Wire.....	74 80
<i>Aproned.</i>	10425— “ “ 2-0, 3-0 and 4-0 Grooved Wire.....	74 80
<i>Aplate.</i>	10426— “ Mall. Iron, Sher., for 0, 2-0, 3-0 and 4-0 Fig. 8 Wire..	39 60
<i>Aptness.</i>	10427— “ “ “ 2-0, 3-0 and 4-0 Grooved Wire....	39 60

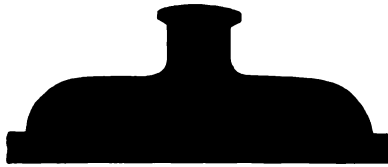
Detroit Trolley Clamps

For Round, Figure 8 and Grooved Wires

THE various forms of Detroit Trolley Clamps listed on this and the following pages have a standard shape of jaws which fit the wire closely.

The designs are heavy throughout and distribution of metal is such as to provide great holding power together with ample clearance for trolley wheels.

Forms 1 and 2



Will meet ordinary requirements for straight line suspension, but the several styles shown on the succeeding pages are recommended where longer and heavier clamps are desired.

Clamp is $1\frac{1}{4}$ inches high.

Form 1—For $\frac{5}{8}$ -inch Stud Bolt—Length 4 Inches

Code Word	No.	List per 100
Armory.	8912—Clamp, Bronze, for 0 Round Wire.....	\$44 00
Arnica.	8913— " " " 2-0 "	44 00
Arrear.	8917— " Mall. Iron, Sher., for 0 and 2-0 Fig. 8 Wire.....	23 00
Artery.	8920— " " " " 3-0 " 4-0 " 8 "	23 10

Form 2—For $\frac{5}{8}$ -inch Stud Bolt—Length 5 Inches

Initiation.	10969—Clamp, Mall. Iron, Sher., for 2-0, 3-0 and 4-0 Grooved Wire.....	\$22 65
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Detroit Trolley Clamps

For Figure 8 and Grooved Wires

Form 3



INTENDED for use where the weight or strain is greater than Forms 1 and 2 Clamps will safely carry and is recommended only for straight line suspension or for very moderate curve construction.

Length of jaws $7\frac{1}{4}$ inches, height overall $1\frac{1}{8}$ inches.

For $\frac{5}{8}$ -inch Stud Bolt

Code Word	No.	List per 100
<i>Inhibit.</i>	10970—Clamp, Mall. Iron, Sher., for 3-0 and 4-0 Fig. 8 Wire.....	\$30 90
<i>Inhibition.</i>	10971— “ Bronze, for 2-0, 3-0 and 4-0 Grooved Wire.....	68 65
<i>Inhibitor.</i>	10972— “ Mall. Iron, Sher., for 2-0, 3-0 and 4-0 Grooved Wire...	29 75

For $\frac{3}{4}$ -inch Stud Bolt

<i>Inhibitory</i>	11013—Clamp, Mall. Iron, Sher., for 3-0 and 4-0 Fig. 8 Wire.....	\$30 90
<i>Inhive.</i>	10973— “ Bronze, for 2-0, 3-0 and 4-0 Grooved Wire.....	71 20
<i>Inhold.</i>	10974— “ Mall. Iron, Sher., for 2-0, 3-0 and 4-0 Grooved Wire...	29 70

Detroit Trolley Clamps

For Grooved Wire

Form 6



DIFFERS from Form 3 clamp listed on preceding page in that it has wide boss $1\frac{1}{2}$ inches in diameter.

Length of jaws, $7\frac{1}{4}$ inches; height overall, $1\frac{7}{8}$ inches.

Code Word	No.	List per 100
<i>Medalist.</i>	11528—Clamp, Mall. Iron, Sher. $\frac{5}{8}$ -inch Boss, for 2-0, 3-0 and 4-0 Grooved Wire.....	\$28 75
<i>Medallic.</i>	11529—Clamp, Bronze, $\frac{5}{8}$ -inch Boss, for 2-0, 3-0, 4-0 Grooved Wire.....	75 90

Pressed Steel Trolley Clamps

For Grooved Wire—Patent Applied For



MADE of pressed steel and has high strength. Lips fit closely to wire and offer great wheel clearance.

Of uniform section throughout length.

Boss made of malleable iron. Lugs on boss fit into holes in steel and relieve screws of weight of wire.

Length, $7\frac{1}{4}$ inches.

Code Word	No.	List per 100
<i>Median.</i>	11533—Clamp, Sherardized, $\frac{5}{8}$ -inch Boss, for 2-0, 3-0 and 4-0 Grooved Wire.....	\$30 80

Detroit Trolley Clamps

For Grooved Wire

Form 4



INTEENDED especially for supporting trolley wire on curves where, on account of severe side strains placed on wire, a clamp of extra length is required.

End jaws are $2\frac{1}{2}$ inches long, overall length 10 inches and height overall 2 inches.

For $\frac{5}{8}$ -inch Stud Bolt

Code Word	No.	List per 100
<i>Aspirant.</i>	8973—Clamp, Mall. Iron, Sher., for 2-0, 3-0, 4-0 Grooved Wire.....	\$35 20

For $\frac{3}{4}$ -inch Stud Bolt

<i>Aspired.</i>	8975—Clamp, Mall. Iron, Sher., for 2-0, 3-0, 4-0 Grooved Wire.....	\$35 20
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Form 5



IS longer and correspondingly heavier throughout than the Form 4 Clamp and is adapted for heavy work on curves.

Overall length is 14 inches, end jaws are 5 inches long and height overall is 2 inches.

For $\frac{5}{8}$ -inch Stud Bolt

Code Word	No.	List per 100
<i>Inholder.</i>	10975—Clamp, Mall. Iron, Sher., for 2-0, 3-0, 4-0 Grooved Wire.....	\$44 00

For $\frac{3}{4}$ -inch Stud Bolt

<i>Inhoop.</i>	10976—Clamp, Mall. Iron, Sher., for 2-0, 3-0, 4-0 Grooved Wire.....	\$44 00
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Detroit Double Strain Clamp



SCREWS are set close together, giving great gripping power. Length 12 inches; diameter of holes for strand, $\frac{1}{4}$ inch, height overall, 2 $\frac{1}{2}$ inches.

Code Word	No.	List per 100
<i>Asterisk.</i>	10370—Clamp, Malleable Iron, Sherardized, $\frac{5}{8}$ -inch Boss, for 2-0, 3-0 and 4-0 Grooved Wire.....	\$61 60
<i>Astound.</i>	10371—Clamp, Malleable Iron, Sherardized, $\frac{3}{4}$ -inch Boss, for 2-0, 3-0 and 4-0 Grooved Wire.....	61 60

Detroit Anchor Clamp



INTEENDED for use where strain is not excessive. Length 7 $\frac{1}{2}$ inches; diameter of hole for strand, $\frac{1}{4}$ inch.

Code Word	No.	List per 100
<i>Mediate.</i>	11599—Anchor Clamp, Mall. Iron, Sher., for 2-0, 3-0 and 4-0 G'v'd Wire.....	\$73 60

Detroit Feeder Clamp

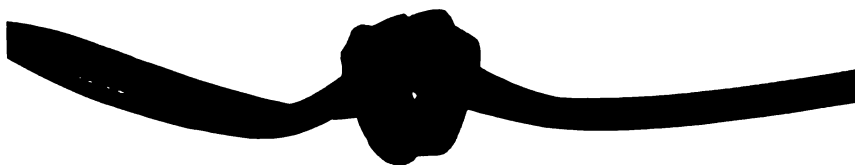


LENGTH 7 $\frac{1}{2}$ inches. Provided with feeder lug which will take a No. 2-0 to 4-0 B. & S. solid or stranded wire. Lips tinned for soldering if desired. Height 2 inches.

Code Word	No.	List per 100
<i>Astral.</i>	8992—Clamp, Bronze, $\frac{5}{8}$ -inch Boss, for 0 Round Wire.....	\$98 90
<i>Astride.</i>	8993—“ “ “ “ 2-0 “ “	98 90
<i>Asunder.</i>	8994—“ “ “ “ 3-0 “ “	98 90
<i>Asylum.</i>	8995—“ “ “ “ 4-0 “ “	98 90
<i>Atheist.</i>	8996—“ “ “ “ 0 and 2-0 Fig. 8 Wire... ..	98 90
<i>Athlete.</i>	8997—“ “ “ “ 3-0 “ 4-0 “ 8 “	98 90
<i>Inhumanly.</i>	10978—“ “ “ “ 2-0, 3-0 and 4-0 G'v'd Wire	98 90
<i>Inhumane.</i>	10979—“ “ “ “ 2-0, 3-0 “ 4-0 “	98 90

O-B Extruded Ears

Patented



THE O-B Extruded Ears listed on the following pages each consist of a malleable iron boss and an extruded metal runner piece.

This runner piece is formed by a hydraulic ram which is brought to bear on a red hot billet of bronze and forces or "extrudes" the metal through a die under several tons of pressure. This die is of a proper shape to produce the finished section required for the various sizes and styles of wires.

This process imparts a wonderful density to the metal and insures absolute uniformity both as to quality of metal and dimensions.

O-B Extruded Metal has a tensile strength of over 75,000 lbs. per square inch and an elastic limit of approximately 50,000 lbs.

This ideal combination of great strength together with high elastic limit insures a metal that is extremely tough and yet is ductile enough to stand great distortion without fracture.

A convincing proof of this is shown by the illustration above which is an actual photograph of a long section of O-B Extruded Ear metal which was pulled into a close knot in a testing machine under several tons tension without showing any fracture of the metal.

Its uniform ductility makes it easy to clinch snugly over the trolley wire and eliminates bumps or crimps and thus insures an exceptionally smooth under-run.

Ends of O-B Extruded Ears do not curl up in service and the malleable iron boss eliminates stripping of threads.

Due to the above physical characteristics, O-B Extruded Ears possess unequalled wearing qualities.

O-B Extruded Trolley Ear

Patented

For Round, Figure 8 and Grooved Wires



CONSISTS of two parts, an extruded metal runner piece and a standardized malleable iron boss, securely riveted upon runner piece. Due to physical characteristics described on preceding page, Extruded Ears possess unequalled wearing qualities.



Round

Lips have a knife edge, fit wire perfectly and offer an exceptionally smooth under-run.

Lips can be easily hammered down tightly over trolley wire without leaving crimps or bumps.

Ends of ear do not curl up in service. Malleable boss eliminates stripping of threads.

Regularly furnished not tinned, but lips can be tinned if so ordered.



Grooved

Code Word	No.	Length 12 Inches					List per 100
<i>Jurist.</i>	11329—	Ear for	0	Round Wire,	1-inch	Boss.....	\$63 80
<i>Juryman.</i>	11330—	"	0	"	"	"	63 80
<i>Justice.</i>	11331—	"	2-0	"	"	"	66 70
<i>Justico.</i>	11332—	"	2-0	"	"	"	66 70
<i>Kabook.</i>	11333—	"	3-0	"	"	"	71 30
<i>Kaiser.</i>	11334—	"	3-0	"	"	"	71 30
<i>Kanchil.</i>	11335—	"	4-0	"	"	"	71 30
<i>Keckle.</i>	11336—	"	4-0	"	"	"	71 30
<i>Mediator.</i>	11849—	"	2-0	Fig. 8	"	"	61 60
<i>Medical.</i>	11850—	"	2-0	"	"	"	61 60
<i>Medley.</i>	11851—	"	3-0	"	"	"	63 80
<i>Medrick.</i>	11852—	"	3-0	"	"	"	63 80
<i>Medulla.</i>	11853—	"	4-0	"	"	"	63 80
<i>Medusa.</i>	11854—	"	4-0	"	"	"	63 80
<i>Kedger.</i>	11337—	"	2-0	Grooved	"	"	61 60
<i>Keelage.</i>	11338—	"	2-0	"	"	"	61 60
<i>Keeler.</i>	11339—	"	3-0	"	"	"	63 80
<i>Keelson.</i>	11340—	"	3-0	"	"	"	63 80
<i>Keener.</i>	11341—	"	4-0	"	"	"	63 80
<i>Kever.</i>	11342—	"	4-0	"	"	"	63 80

Numbers 11849 to 11854 can be furnished 10 inches long and all of above Ears can be furnished 15 inches long to order at proportionate prices.

O-B Extruded Feeder Ear

Patented

For Round, Figure 8 and Grooved Wires



SIMILAR to regular Extruded Ear described on preceding page with addition of a horizontal bronze feeder lug drilled to accommodate No. 2-0 to 4-0 B. & S. solid or stranded wire.

Feeder lug is both riveted and soldered to Extruded metal runner piece.

Groove of runner piece is tinned for soldering.

		Length 12 Inches					
Code Word	No.					List per 100	
Keller.	11343—	Feeder Ear for	0	Round Wire,	$\frac{1}{2}$ -inch Boss	\$103	50
Keralose.	11344—	" "	0	" "	" "	103	50
Kernel.	11345—	" "	2-0	" "	" "	108	10
Keynote.	11346—	" "	2-0	" "	" "	108	10
Killdeer.	11347—	" "	3-0	" "	" "	115	00
Killow.	11348—	" "	3-0	" "	" "	115	00
Kilting.	11349—	" "	4-0	" "	" "	115	00
Kindle.	11350—	" "	4-0	" "	" "	115	00
Meekly.	11855—	" "	2-0	Fig. 8	" "	103	50
Meekness.	11856—	" "	2-0	" "	" "	103	50
Megaderm.	11857—	" "	3-0	" "	" "	108	10
Megarian.	11858—	" "	3-0	" "	" "	108	10
Melanure.	11859—	" "	4-0	" "	" "	108	10
Melassic.	11860—	" "	4-0	" "	" "	108	10
Kindred.	11351—	" "	2-0	Grooved	" "	103	50
Kinetic.	11352—	" "	2-0	" "	" "	103	50
Kingbird.	11353—	" "	3-0	" "	" "	108	10
Kingfish.	11354—	" "	3-0	" "	" "	108	10
Kinglet.	11355—	" "	4-0	" "	" "	108	10
Kinsfolk.	11356—	" "	4-0	" "	" "	108	10

Numbers 11855 to 11860 can be furnished 10 inches long and all above ears can be furnished 15 inches long to order at proportionate prices.

O-B Extruded Double Strain Ear

Patented



CONSISTS of a sherardized, malleable iron boss and an extruded metal runner piece. Eyes are $\frac{1}{16}$ inch in diameter.

Length 15 Inches

Code Word	No.						List per 100
<i>Melchite.</i>	11861—	Ear for	0	Round	Wire, $\frac{1}{16}$ -inch	Boss	\$ 85 00
<i>Melenite.</i>	11862—	"	0	"	"	"	85 00
<i>Melibian.</i>	11863—	"	2-0	"	"	"	92 00
<i>Melilot.</i>	11864—	"	2-0	"	"	"	92 00
<i>Mellific.</i>	11865—	"	3-0	"	"	"	100 00
<i>Mellow.</i>	11866—	"	3-0	"	"	"	100 00
<i>Melodic.</i>	11867—	"	4-0	"	"	"	101 60
<i>Melodean.</i>	11868—	"	4-0	"	"	"	101 60
<i>Melodize.</i>	11869—	"	2-0	Fig. 8	"	"	78 00
<i>Melody.</i>	11870—	"	2-0	"	"	"	78 00
<i>Melotype.</i>	11871—	"	3-0	"	"	"	82 00
<i>Membered.</i>	11872—	"	3-0	"	"	"	82 00
<i>Memento.</i>	11873—	"	4-0	"	"	"	84 30
<i>Memoir.</i>	11874—	"	4-0	"	"	"	84 30
<i>Memorate.</i>	11875—	"	2-0	Grooved	"	"	78 00
<i>Memorist.</i>	11876—	"	2-0	"	"	"	78 00
<i>Memphian.</i>	11877—	"	3-0	"	"	"	82 00
<i>Mendole.</i>	11878—	"	3-0	"	"	"	82 00
<i>Menhaden.</i>	11879—	"	4-0	"	"	"	84 30
<i>Menald.</i>	11880—	"	4-0	"	"	"	84 30

Metropolitan Strain Plate

Patented

For Round and Grooved Wires

With Extruded Ear

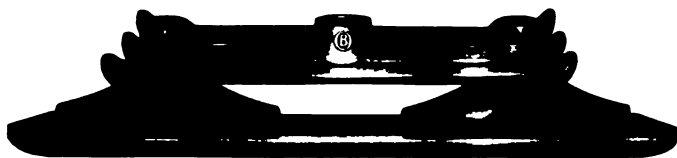


Plate is a sherardized malleable iron casting and is intended to be supported from some form of straight line hanger.

A hole $\frac{1}{2}$ -inch in diameter at each corner of Strain Plate permits attachment of guy wires.

Two $\frac{1}{2}$ x 1 inch sherardized machine bolts equipped with lock washers are included with each plate.

Plate is furnished with boss tapped for either $\frac{5}{8}$ or $\frac{3}{4}$ -inch hanger stud.

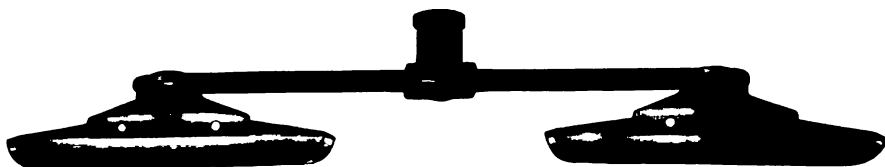
Extruded ear is equipped with two bosses for attaching to strain plate and is tinned for soldering. Length of ear, 15 inches.

Code Word	No.	List per 100
<i>Ballads.</i>	2442—Strain Plate only, Mall. Iron, Sher., for $\frac{1}{2}$ -inch Hanger Stud.	\$ 79 20
<i>Ballader.</i>	6775— " " " " " " " " " " " "	79 20
<i>Meniscus.</i>	11601—Ear only, Extruded, for 0 Round Wire.	92 40
<i>Meniver.</i>	11602— " " " " " 2-0 " " " " " "	94 60
<i>Mentally.</i>	11603— " " " " " 3-0 " " " " " "	99 00
<i>Menthene.</i>	11604— " " " " " 4-0 " " " " " "	101 20
<i>Mentor.</i>	11605— " " " " " 2-0 Grooved " " " " " "	85 80
<i>Mercable.</i>	11606— " " " " " 3-0 " " " " " "	88 00
<i>Mercaptal.</i>	11607— " " " " " 4-0 " " " " " "	92 40

Detroit Trolley Clamps, Forms 1, 2 or 3 listed on pages 154 and 155 may be used with Metropolitan Strain Plates instead of Extruded Ears listed above.

Flexible Extruded Trolley Ear

Patented



CONSISTS of two short extruded ears attached to a flat steel spring having a boss at its center for attachment to hanger.

Especially adapted for use under elevated structures and similar places where suspension is ordinarily very rigid.

Spring provides great flexibility, eliminates the "hard spot" and reduces tendency of wire to crystallize and break at suspension point.

Length overall, 15 inches; length ears, 5 inches; height overall, $2\frac{3}{4}$ inches.

Code Word	No.	List per 100
<i>Mercenary.</i>	11615—Ear for 0 Round Wire, $\frac{5}{8}$ -inch Boss.....	\$108 20
<i>Merciful.</i>	11616— " " 2-0 " " $\frac{5}{8}$ " "	112 10
<i>Mercuric.</i>	11617— " " 3-0 " " $\frac{5}{8}$ " "	116 70
<i>Meresman.</i>	11618— " " 4-0 " " $\frac{5}{8}$ " "	117 55
<i>Mericaip.</i>	11619— " " 2-0 Grooved " $\frac{5}{8}$ " "	103 25
<i>Meridian.</i>	11620— " " 3-0 " " $\frac{5}{8}$ " "	105 60
<i>Merils.</i>	11621— " " 4-0 " " $\frac{5}{8}$ " "	106 55

O-B Bronze Metal



O-B Chemical Laboratory

O-B EARS, Splicers and other bronze devices have earned an enviable reputation for service because of the high grade of metal used in their manufacture.

O-B Bronze, in its present state of development, is the result of constant experimenting and striving to improve during the twenty years that we have been making overhead materials for railways.

The highest degree of uniformity is obtained by close co-operation between foundry and chemical laboratory. An expert metallurgical chemist superintends the mixing of the pure ingot metals used exclusively in O-B Bronze. The fact that not an ounce of scrap metal is used makes it possible to mix the ingredients with a certainty of obtaining in the resultant metal a very close approximation to the established standard. There is no guess work. As an additional precaution, chemical analyses are made of samples taken from every heat.

Well defined standards, faithfully adhered to and constant following of the O-B watchword, "Quality First," assure users of O-B Bronze a maximum of service and satisfaction.

Clinch Trolley Ear

For Round Wire



THIS Ear is cast solid and wire groove in lips is milled out accurately to size.

Lips are of uniform thickness, and a slight bevel on outside of lips produces a sharp edge, but retains original tough skin of bronze casting for a wearing surface and eliminates brittleness sometimes caused by grinding.



Lips afford a smooth under-run to trolley wheel.

A heavy web extends to top of boss and boss extends entirely down to lips. Can be furnished tinned for soldering if desired.

Metal used is a high grade bronze especially mixed for this service and is extremely tough though not brittle and has exceptionally long life.

This metal mixture is continually checked by our chemical laboratory so as to insure absolutely uniform results from every heat.

Length 9 Inches

Code Word	No.	List per 100
<i>Atoll.</i>	10019—Ear, Bronze, for 0 Round Wire, $\frac{1}{8}$ -inch Boss.....	\$46 00
<i>Attune.</i>	10020— “ “ “ 2-0 “ “ “ “	48 30

Length 12 Inches

<i>Atwain.</i>	10021—Ear, Bronze, for 0 Round Wire, $\frac{1}{8}$ -inch Boss.....	\$52 90
<i>Auburn.</i>	10022— “ “ “ 2-0 “ “ “ “	55 20

Length 15 Inches

<i>Audacity.</i>	10023—Ear, Bronze, for 0 Round Wire, $\frac{1}{8}$ -inch Boss.....	\$59 80
<i>Audible.</i>	10024— “ “ “ 2-0 “ “ “ “	64 40
<i>Audition.</i>	10025— “ “ “ 2-0 “ “ “ “	64 40
<i>Augment.</i>	10026— “ “ “ 3-0 “ “ “ “	70 40
<i>Augury.</i>	10027— “ “ “ 3-0 “ “ “ “	70 40
<i>Aurated.</i>	10028— “ “ “ 4-0 “ “ “ “	74 80
<i>Aureole.</i>	20029— “ “ “ 4-0 “ “ “ “	74 80

Clinch Feeder Ear

With Horizontal Feeder Lug—For Round Wire

Tinned for Soldering



THIS Ear is cast solid and the wire groove in the lips is milled out accurately to size.

Lips are of uniform thickness and a slight bevel on outside of lips produces a sharp edge, but retains original tough skin of bronze casting for a wearing surface and eliminates brittleness sometimes caused by grinding.

Lips afford a smooth under-run to trolley wheel.

A heavy web extends to top of boss and boss extends entirely down to the lips.

Metal used is a high grade bronze especially mixed for this service and is extremely tough though not brittle and has exceptionally long life.

This metal mixture is continually checked by our chemical laboratory so as to insure absolutely uniform results from every heat.

The feeder lug is drilled to accommodate 2-0 to 4-0 B. & S. solid or stranded wire.

Length of Ear is 15 inches; groove is tinned for soldering.

Code Word	No.	List per 100
<i>Auric.</i>	10061—Feeder Ear, Bronze, for 0 Round Wire, $\frac{1}{2}$ -inch Boss . . .	\$ 85 40
<i>Auricle.</i>	10063—“ “ “ “ 2-0 “ “ “ . . .	90 10
<i>Aurist.</i>	10064—“ “ “ “ 2-0 “ “ “ . . .	90 10
<i>Aurora.</i>	10065—“ “ “ “ 3-0 “ “ “ . . .	94 70
<i>Auspice.</i>	10066—“ “ “ “ 3-0 “ “ “ . . .	94 70
<i>Austere.</i>	10067—“ “ “ “ 4-0 “ “ “ . . .	101 65
<i>Authors.</i>	10068—“ “ “ “ 4-0 “ “ “ . . .	101 65

Clinch Trolley Ears

For Grooved Wire



BOTH web and boss are heavy and lips conform closely to shape of trolley wire.

Lips Tinned for Soldering

Code Word	No.											List per 100
<i>Backward.</i>	10350—	Ear, Bronze, for 2-0 G'v'd Wire, $\frac{1}{4}$ -in. Boss, length 12 in...										\$67 00
<i>Bacons.</i>	10351—	" " " 3-0 " " " " " " " " " "										15 " ... 81 30
<i>Bacteria.</i>	10352—	" " " 3-0 " " " " " " " " " "										15 " ... 81 30
<i>Baculine.</i>	10353—	" " " 4-0 " " " " " " " " " "										15 " ... 86 85
<i>Baddish.</i>	10354—	" " " 4-0 " " " " " " " " " "										15 " ... 86 85

Lips Not Tinned

<i>Badgerer.</i>	10355—	Ear, Bronze, for 2-0 G'v'd Wire, $\frac{1}{4}$ -in. Boss, length 12 in...										\$63 75
<i>Badinage.</i>	10356—	" " " 3-0 " " " " " " " " " "										15 " ... 77 05
<i>Badness.</i>	10357—	" " " 3-0 " " " " " " " " " "										15 " ... 77 05
<i>Baffler.</i>	10358—	" " " 4-0 " " " " " " " " " "										15 " ... 79 90
<i>Baffling.</i>	10359—	" " " 4-0 " " " " " " " " " "										15 " ... 79 90

Clinch Feeder Ear

For Grooved Wire



SAME design Ear as described above, with addition of feeder lug drilled for 2-0 to 4-0 solid or stranded feeder wire. Lips are tinned for soldering.

Code Word	No.											List per 100
<i>Baggager.</i>	10373—	Ear, Bronze, for 2-0 G'v'd Wire, $\frac{1}{4}$ -in. Boss, length 12 in...										\$ 87 40
<i>Bagging.</i>	10374—	" " " 3-0 " " " " " " " " " "										15 " ... 101 20
<i>Bagnet.</i>	10375—	" " " 3-0 " " " " " " " " " "										15 " ... 101 20
<i>Bagpipe.</i>	10376—	" " " 4-0 " " " " " " " " " "										15 " ... 108 10
<i>Barlable.</i>	10377—	" " " 4-0 " " " " " " " " " "										15 " ... 108 10

Clinch Anchor Ear

For Round and Grooved Wires



LIPS are tinned for soldering, made of bronze of high tensile strength. Hole for guy wire is $\frac{3}{8}$ inch in diameter and is ribbed to give bearing surface for guy wire.

Code Word	No.	List per 100
<i>Merino.</i>	11881—Ear, Bronze, for 0 Round and G'v'd Wires, length 8 in..	\$52 80
<i>Meritory.</i>	11882— “ “ “ 2-0 “ “ “ “ “ 8 “ ..	55 00
<i>Merling.</i>	11883— “ “ “ 3-0 “ “ “ “ “ 9 “ ..	57 20
<i>Mermaid.</i>	11884— “ “ “ 4-0 “ “ “ “ “ 9 “ ..	61 60

Clinch Double Strain Ear

For Round Wire



STRAIN lugs for attaching guy wires have holes $\frac{1}{16}$ inch in diameter. A bronze of high tensile strength is used. Length 15 inches. Lips are tinned for soldering.

Code Word	No.	List per 100
<i>Isopathy.</i>	11176—Strain Ear, Bronze, for 0 Round Wire, $\frac{5}{8}$ -inch Boss.....	\$103 50
<i>Isopoda.</i>	11177— “ “ “ “ 2-0 “ “ “ “ “	103 50
<i>Isoprene.</i>	11178— “ “ “ “ 2-0 “ “ “ “ “	103 50
<i>Isorcin.</i>	11179— “ “ “ “ 3-0 “ “ “ “ “	119 60
<i>Isorropic.</i>	11180— “ “ “ “ 3-0 “ “ “ “ “	119 60
<i>Isosceles.</i>	11181— “ “ “ “ 4-0 “ “ “ “ “	118 80
<i>Isosporic.</i>	11182— “ “ “ “ 4-0 “ “ “ “ “	118 80

Walker Trolley Ear

For Round Wire



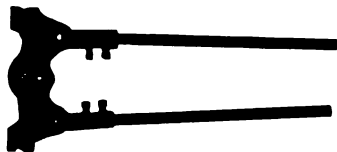
DESIGNED for both straight line and curve suspension, and affords a support for a trolley wire that minimizes tendency of trolley wheel to spark when passing under it, as the lower surface of Ear and trolley wire are on same plane, and of same size, making a perfectly straight under-running surface.

Trolley wire is bent to proper curvature to conform to shape of Ear by a special tool, which makes it a quick and easy operation to place Ear in position on line. If necessary to change position of hanger on line, center and end lugs of Ear can be bent back sufficiently to allow trolley wire to be removed and straightened for replacing.

It is an excellent support for trolley wire on curves, as it affords a solid wall of metal on one side against which trolley wire can rest. Length $8\frac{1}{4}$ inches.

Code Word	No.	List per 100
<i>Arise.</i>	6679—Ear, Bronze, for 0 Round Wire, $\frac{1}{2}$ -inch Boss.....	\$50 60
<i>Avoke.</i>	6681— “ “ “ 2-0 “ “ “	50 60
<i>Avolate.</i>	6683— “ “ “ 3-0 “ “ “	52 90
<i>Avowals.</i>	6685— “ “ “ 4-0 “ “ “	55 20

Walker Forming Tool



Used for shaping trolley wire to conform to Walker Ear.

Code Word	No.	List per 100
<i>Avulsion.</i>	1108—Forming Tool for Walker Ear.....	\$427 35

Spillman Trolley Ear

For Round Wire



AN excellent Ear for use on curves and should be hung so that side strain of trolley wire is against closed side of groove. Length 9 inches.

Code Word	No.	List per 100
<i>Awaken.</i>	1110—Ear, Bronze, for 0 Round Wire, $\frac{1}{2}$ -inch Boss	\$55 20
<i>Axial.</i>	2271—“ “ “ 2-0 “ “ “	55 20
<i>Axiom.</i>	2273—“ “ “ 3-0 “ “ “	59 40
<i>Azled.</i>	2305—“ “ “ 4-0 “ “ “	59 40

Jewell Trolley Sling

For Round Wire



ESPECIALLY adapted for straight line work where a flexible support is desired. To install, remove swiveled boss, place trolley wire in groove and bend lips over it, finally replacing boss and attaching Ear to hanger.

Length $9\frac{1}{4}$ inches, height overall $2\frac{5}{8}$ inches.

Boss, malleable iron, sherardized.

Code Word	No.	List per 100
<i>Azman.</i>	1113—Sling, Bronze, for 0 Round Wire, $\frac{1}{2}$ -inch Boss	\$39 60
<i>Azoic.</i>	2307—“ “ “ 2-0 “ “ “	39 60
<i>Azoth.</i>	2309—“ “ “ 3-0 “ “ “	44 00
<i>Azure.</i>	2311—“ “ “ 4-0 “ “ “	44 00

Clinch Splicing Ear

For Round and Grooved Wires



BOSS and web are reinforced by a heavy rib at top of web and design is such that a straight under-run is ensured.

Ear is made of high strength bronze with $\frac{7}{16}$ x 1-inch set screws; groove is tinned for soldering. Length is 15 inches.

Code Word	No.		List per 100
<i>Banish.</i>	10360—	Splicing Ear for 0 Round Wire, $\frac{3}{4}$ -inch Boss	\$120 70
<i>Banister.</i>	10361—	" " 2-0 " " "	146 30
<i>Bankable.</i>	10362—	" " 2-0G'v'd and 3-0 Round Wire, $\frac{3}{4}$ -in. Boss	149 40
<i>Bankbook.</i>	10363—	" " 2-0 " " 3-0 " " "	149 40
<i>Banker.</i>	10364—	" " 3-0 " " 4-0 " " "	155 45
<i>Bannerol.</i>	10365—	" " 3-0 " " 4-0 " " "	155 45
<i>Bannock.</i>	10366—	" " 4-0 " Wire, $\frac{3}{4}$ -inch Boss	161 50
<i>Bantams.</i>	10367—	" " 4-0 " " $\frac{3}{4}$ " "	161 50

Combination Splicing Ear

Patented

For Round and Figure 8 Wires



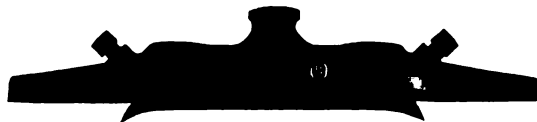
AN efficient and practical device for splicing together a round and Fig. 8 wire. Solder is used for attaching round wire, while steel rivets or solder, or both, can be used for fastening Fig. 8 wire. Can be supplied for use with any size of round wire from 0 to 4-0 in combination with any size of Fig. 8 wire from 0 to 4-0. Made of high strength bronze. Length 12 inches.

Code Word	No.		List per 100
<i>Barber.</i>	2078—	Combination Ear for 0 Wire, $\frac{3}{4}$ -inch Boss	\$198 00
<i>Barded.</i>	2505—	" " 2-0 " " "	198 00
<i>Barefoot.</i>	2506—	" " 3-0 " " "	206 80
<i>Barely.</i>	2507—	" " 4-0 " " "	206 80

In ordering Ears state size of both Round and Fig. 8 Trolley Wires.

Clark Splicing Ear

For Figure 8 Wire



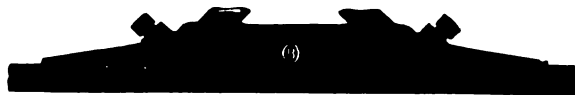
INTENDED to be used without solder, the fastening obtained by $\frac{7}{16} \times \frac{7}{8}$ -inch set screws being amply secure for all ordinary conditions.

Solder may be used in addition, however, the strength of the fastening being materially increased thereby. Made of high strength bronze. Length 12 inches.

Code Word	No.	List per 100
<i>Banter.</i>	2516—Splicing Ear, Bronze, for 0 Fig. 8 Wire, $\frac{3}{8}$ -inch Boss	\$121 00
<i>Bantling.</i>	2517—“ “ “ “ 2-0 “ 8 “ “	121 00
<i>Baptism.</i>	2518—“ “ “ “ 3-0 “ 8 “ “	125 40
<i>Barbaric.</i>	2519—“ “ “ “ 4-0 “ 8 “ “	125 40

Clark Trolley Wire Splicer

For Round, Figure 8 and Grooved Wires



SAME design as the Clark Splicing Ear listed above, differing only in having the central boss omitted. Made of high strength bronze. Length 10 inches, set screws $\frac{7}{16} \times \frac{7}{8}$ inch.

Code Word	No.	List per 100
<i>Messenger.</i>	11885—Splicer, Bronze, for 0 Round and Grooved Wires	\$80 00
<i>Messiad.</i>	11886—“ “ “ “ 2-0 “ “ “ “	80 00
<i>Messmate.</i>	11887—“ “ “ “ 3-0 “ “ “ “	82 00
<i>Mestizo.</i>	11888—“ “ “ “ 4-0 “ “ “ “	84 00
<i>Barbary.</i>	2520—“ “ “ “ 0 Fig. 8 Wire	88 00
<i>Barbecue.</i>	2521—“ “ “ “ 2-0 “ 8 “	88 00
<i>Barbican.</i>	2522—“ “ “ “ 3-0 “ 8 “	96 80
<i>Bareback.</i>	2523—“ “ “ “ 4-0 “ 8 “	96 80

Type B Splicing Ear

Form 2—Patent Applied For

Malleable Iron—With Renewable Bronze Tips



Nos. 11095-11185, With Boss

USED in Catenary construction and for ordinary construction where a strong, high grade device is desired.

Body is malleable iron, sherardized, and fitted with renewable bronze tips, having lips $6\frac{1}{2}$ inches in length.

Furnished both with and without boss as boss is used only when Splicer is installed at a cross span or pole bracket.

Wire is held in place by $\frac{1}{16} \times \frac{3}{4}$ -inch set screws which force it into shallow depressions in the wire seat, thus forming slight kinks in the wire and greatly increasing the holding power.

Wire is brought in so as to afford smoothest possible under-run for trolley wheel and at the same time avoid a sharp bend which would weaken it.

A sufficient cross section of iron is used to give conductivity equal to that of the trolley wire. This design affords unequalled clearance for trolley wheels, great mechanical strength and long life. Length overall is $21\frac{1}{2}$ inches.

With Boss

Code Word	No.		List per 100
<i>Injuria.</i>	11095—	Splicer, $\frac{1}{16}$ -inch Boss, for 0 and 2-0 Round and Grooved Wires	\$187 35
<i>Isotropy.</i>	11183—	" " " " 0 " 2-0 " " " "	187 35
<i>Iodizer.</i>	11169—	" " " " 3-0 Round and Grooved Wires	210 55
<i>Issuant.</i>	11184—	" " " " 3-0 " " " " "	210 55
<i>Iodous.</i>	11170—	" " " " 4-0 " " " " "	210 55
<i>Isthmian.</i>	11185—	" " " " 4-0 " " " " "	210 55

Without Boss

<i>Inker.</i>	11096—	Splicer, without Boss, for 0 and 2-0 Round and Grooved Wires	\$172 40
<i>Ioduret.</i>	11171—	" " " " 3-0 Round and Grooved Wires	175 60
<i>Iodyrite.</i>	11172—	" " " " 4-0 " " " " "	175 60

Extra Parts

<i>Inkfish</i>	11097—	Boss only, $\frac{1}{16}$ -inch, complete with Pin and Cotter	\$ 22 00
<i>Isthmus.</i>	11186—	" " " " " " " " "	22 00
<i>Inustion.</i>	11105—	Renewable Bronze Tip for 0 and 2-0 Round and Grooved Wires	44 00
<i>Iolite.</i>	11173—	" " " " 3-0 Round and Grooved Wires	55 00
<i>Iomoth.</i>	11174—	" " " " 4-0 " " " " "	66 00

Type A Trolley Wire Splicer



USED with grooved wire for direct suspension and Catenary construction where conditions are severe as it meets the most exacting requirements.

Is of heavy design and made of high strength bronze. It is capable of breaking 4-0 Phono Electric or steel trolley wire without failure of Splicer.

Allows sufficient clearance for narrow grooved trolley wheels.

Wire is brought in so as to give a straight under-run and is secured by four $\frac{1}{2}$ x1-inch set screws without encountering a short radius bend which would materially weaken it.

Code Word
Infrugal.

No. 10647—Splicer, Bronze, 25 inches long, for 4-0 Grooved Wire . . . \$440 00

List per 100

Type A Splicing Ear



Same general design as Splicer listed above but has a boss for use when it is desired to attach it to a hanger.

Set screws are $\frac{1}{2}$ x1 inch.

Length, 30 inches.

Code Word
Milkweed.

No. 10240—Splicing Ear, Bronze, $\frac{3}{8}$ -inch Boss, for 4-0 Grooved Wire . . . \$569 25

List per 100

Above splicer can be furnished to order with $\frac{3}{4}$ -inch boss.

Type C Trolley Wire Splicer

Patent Applied For
"No Wire Bend"



GIVES unusual clearance for trolley wheel and smooth under-run, free from bumps or depressions.

Lips are ground to knife edge at ends and left thicker toward center. Metal is so distributed that Splicer is not top heavy.

Installation is easy. Wire enters in straight line, no forming being necessary.

Holes in center show when wires are inserted to proper distance.
Barrier at center prevents wire from going past center of Splicer.

Heavy steel set screws will not twist off. They are set far enough apart to give plenty of wrench room.

Slight depression under each set screw gives holding power greater than strength of wire.

Can be used efficiently on either new or badly worn wire. Length 20 inches.

Code Word	No.	List per 100
<i>Museum.</i>	11612—Splicer, Bronze, for 0 and 2-0 Round and Grooved Wires.....	\$198 00
<i>Mission.</i>	11696—“ “ “ 3-0 Round and Grooved Wires.....	220 00
<i>Mistfull.</i>	11614—“ “ “ 4-0 “ “ “ “.....	220 00
<i>Mistress</i>	11613—“ “ “ 3-0 Fig. 8 Wire.....	253 00
<i>Misturn</i>	11695—“ “ “ 4-0 “ 8 “.....	253 00

Type C Splicing Ear

Patent Applied For "No Wire Bend"



Similar to splicer described above except being provided with a boss.

Code Word	No.	List per 100
<i>Mobility.</i>	11921—Ear, Bronze, for 0 and 2-0 Round and Grooved Wire, $\frac{1}{8}$ -inch Boss.	\$242 00
<i>Mobocrat.</i>	11922—Ear, Bronze, for 0 and 2-0 Round and Grooved Wire, $\frac{1}{4}$ -inch Boss.	242 00
<i>Mockable.</i>	11923—Ear, Bronze, for 3-0 Round and Grooved Wire, $\frac{1}{8}$ -inch Boss.	253 00
<i>Mockbird.</i>	11924—“ “ “ 3-0 “ “ “ “ “ “	253 00
<i>Modalist.</i>	11925—“ “ “ 4-0 “ “ “ “ “ “	253 00
<i>Modeler.</i>	11926—“ “ “ 4-0 “ “ “ “ “ “	253 00

O-B Cleveland Trolley Wire Splicer



THIS form of Splicer was first made by The Ohio Brass Company for the Cleveland Electric Railway Company in the year 1898 and was listed in our Catalogues Numbers 4 and 5 as the "Century" Splicer. The design of the splicer as listed herewith has been somewhat revised to meet present day requirements.

Wires are held in place by steel chucks, serrated on inside to give a grip on wires and tapered on outside to fit into a tapered hole in the body. Any tension added to the wire tends to increase the grip of the chucks. Chucks will hold badly worn wire as tightly as new wire.

Length, 20 inches.

Code Word	No.		List per 100
<i>Mightily.</i>	11669—	Splicer, Bronze, for 0 Round Wire.....	\$218 50
<i>Mighty.</i>	11670—	" " " 2-0 " "	218 50
<i>Migrant.</i>	11671—	" " " 3-0 " "	230 00
<i>Migration.</i>	11672—	" " " 4-0 " "	230 00
<i>Mikado.</i>	11673—	" " " 2-0 Grooved Wire.....	218 50
<i>Mildness.</i>	11674—	" " " 3-0 " "	230 00
<i>Milepost.</i>	11675—	" " " 4-0 " "	230 00
<i>Milesian.</i>	11676—	Chuck, Sherardized, for 0 Round Wire.....	22 00
<i>Milfoil.</i>	11677—	" " " 2-0 " and 0 Grooved Wires.....	22 00
<i>Militant.</i>	11678—	" " " 3-0 " Wire.....	22 00
<i>Military.</i>	11679—	" " " 4-0 " "	22 00
<i>Militia.</i>	11680—	" " " 2-0 Grooved Wire.....	22 00
<i>Milker.</i>	11681—	" " " 3-0 " "	22 00
<i>Milkmaid.</i>	11682—	" " " 4-0 " "	22 00

O-B Cleveland Splicing Ear



THIS form of Splicer was first made by The Ohio Brass Company for the Cleveland Electric Railway Company in the year 1898 and was listed in our Catalogues Numbers 4 and 5 as the "Century" Splicer. The design of the splicer as listed herewith has been somewhat revised to meet present day requirements.

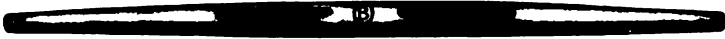
Wires are held in place by steel chucks, serrated on inside to give a grip on wires and tapered on outside to fit into a tapered hole in the body. Any tension added to the wire tends to increase the grip of the chucks. Chucks will hold badly worn wire as tightly as new wire.

Boss is removable and is made from cold-rolled steel.

Length, 20 inches.

Code Word	No.	List per 100									
<i>Mesially.</i>	11655—	Splicing Ear, Bronze,	$\frac{5}{8}$ -inch	Boss, for 0	Round Wire.	.....	\$242	00			
<i>Mesoderm.</i>	11656—	"	"	"	" 0	"	.....	242	00		
<i>Mesodont.</i>	11657—	"	"	"	" 2-0	"	.....	242	00		
<i>Mesolite.</i>	11658—	"	"	"	" 2-0	"	.....	242	00		
<i>Mesozoic.</i>	11659—	"	"	"	" 3-0	"	.....	253	00		
<i>Mesquite.</i>	11660—	"	"	"	" 3-0	"	.....	253	00		
<i>Metage.</i>	11661—	"	"	"	" 4-0	"	.....	253	00		
<i>Metamer.</i>	11662—	"	"	"	" 4-0	"	.....	253	00		
<i>Metasome.</i>	11663—	"	"	"	" 2-0	Grooved Wire.	.....	242	00		
<i>Meteor.</i>	11664—	"	"	"	" 2-0	"	.....	242	00		
<i>Meteoric.</i>	11665—	"	"	"	" 3-0	"	.....	253	00		
<i>Meterage.</i>	11666—	"	"	"	" 3-0	"	.....	253	00		
<i>Melthame.</i>	11667—	"	"	"	" 4-0	"	.....	253	00		
<i>Methylic.</i>	11668—	"	"	"	" 4-0	"	.....	253	00		
<i>Milesian.</i>	11676—	Chuck, Sherardized, for 0	Round Wire.	.....				22	00		
<i>Milfoil.</i>	11677—	"	"	" 2-0	" and 0	Grooved Wires.	.....	22	00		
<i>Militant.</i>	11678—	"	"	" 3-0	" Wire.	.....		22	00		
<i>Military.</i>	11679—	"	"	" 4-0	"	.....		22	00		
<i>Militia.</i>	11680—	"	"	" 2-0	Grooved Wire.	.....		22	00		
<i>Milker.</i>	11681—	"	"	" 3-0	"	.....		22	00		
<i>Milkmaid.</i>	11682—	"	"	" 4-0	"	.....		22	00		

For Round and Grooved Wires



K-I Trolley Wire Splicers

Regular



TROLLEY wire is secured in place by means of tapered steel dogs, which are barbed on one side to grip wire, and tapered on the other to correspond to tapered inner wall of Splicer. No soldering is necessary, as tension of wire is sufficient to keep dogs in place. Circular in shape and made of high strength bronze.

Code Word	No.	List per 100
<i>Beacon.</i>	5692—Splicer for 0 Round Wire, length 10 inches.....	\$ 83 60
<i>Beagle.</i>	5693—“ “ 2-0 “ “ “ 11 “	90 20
<i>Beaked.</i>	5694—“ “ 3-0 “ “ “ 12 “	96 80
<i>Beamful.</i>	5695—“ “ 4-0 “ “ “ 15 “	118 80
<i>Beard.</i>	5696—“ “ 0 Fig. 8 “ “ “ 9 ³ / ₄ “	83 60
<i>Beast.</i>	5697—“ “ 2-0 “ 8 “ “ “ 9 ³ / ₄ “	83 60
<i>Beautify.</i>	5698—“ “ 3-0 “ 8 “ “ 11 ¹ / ₂ “	105 60
<i>Beautiful.</i>	5699—“ “ 4-0 “ “ “ 15 “	118 80
<i>Beaver.</i>	8571—“ “ 2-0 Grooved “ “ 12 “	96 80
<i>Beckon.</i>	8572—“ “ 3-0 “ “ “ 15 “	118 80
<i>Bedeck.</i>	8573—“ “ 4-0 “ “ “ 15 “	147 40
<i>Behavior.</i>	5700—Dogs for Splicer.....	6 60

Combination



SIMILAR in internal construction to regular form listed above but arranged for splicing the various combinations as listed below.

Code Word	No.	List per 100
<i>Beehive.</i>	5703—Splicer for 0 Fig. 8 to 0 Round Wire, length 10 inches.....	\$110 00
<i>Beetle.</i>	5705—Splicer for 3-0 Fig. 8 to 3-0 Round or 2-0 Grooved Wire, length 12 inches.....	220 00
<i>Beggar.</i>	5706—Splicer for 4-0 Fig. 8 to 4-0 Round or 3-0 Grooved Wire, length 15 inches.....	242 00
<i>Begrimer.</i>	10414—Splicer for 2-0 Round to 4-0 Round or 3-0 Grooved Wire, length 15 inches.....	242 00
<i>Beguile.</i>	10415—Splicer for 3-0 Fig. 8 to 4-0 Round or 3-0 Grooved Wire, length 15 inches.....	242 00
<i>Behavior.</i>	5700—Dogs for Splicer.....	6 60

In ordering Combination Splicers state name of gauge and gauge number of both Round or Grooved and Fig. 8 Trolley Wires.

Feeder Wire Splicer

For Stranded Copper Wire



THIS Splicer consists of a special high-strength bronze sleeve with an enlarged recess at the center. The Cable ends are inserted and butted together at the center of the Splicer and the two heavy set-screws are forced through the strands, spreading them out within the enlarged center recess. The Splicer is then completely filled with solder, making an absolutely perfect splice, both electrically and mechanically, the bent wire ends being so firmly imbedded in the solder that the cable will break rather than pull out of the sleeve when properly installed.

Splicer is tinned all over and can be quickly installed.

Code Word	No.	List per 100
<i>Flippant.</i>	10489—Splicer for 4-0 to 300,000 C. M. Cable, length 5½ inches	\$171 60
<i>Flitter.</i>	10490—“ “ 350,000 C. M. Cable, length 5½ inches	176 00
<i>Flitting.</i>	10491—“ “ 400,000 “ “ 6 “	215 60
<i>Flobert.</i>	10492—“ “ 500,000 “ “ 6 “	217 80
<i>Flogger.</i>	10493—“ “ 800,000 “ “ 7 “	330 00
<i>Flooder.</i>	10494—“ “ 1,000,000 “ “ 7 “	330 00

K-I Feeder Wire Splicer

For Solid Wire



A SIMPLE and effective Splicer using the popular K-I principle with the steel dogs which, when driven into place, hold the wire firmly. Solder is then poured into the opening in the center, filling the interior and making a permanent electrical contact between the wires.

Splicer is tinned for soldering. Length 6½ inches.

Code Word	No.	List per 100
<i>Juratory.</i>	11310—Splicer, Bronze, for 0 and 2-0 Round Wire	\$ 77 00
<i>Injoint.</i>	11014—“ “ “ 3-0 “ 4-0 “ “	88 00

Type A Feed-In Yoke



MADE of bronze with a sherardized machine bolt fitted with a lock washer. Lips are tinned for soldering

Will accommodate 2-0 to 4-0 B. & S. solid or stranded feeder wire.

Lower face of boss is machined so as to make a full contact with ear or clamp.

Height $2\frac{1}{8}$ inches. Length $5\frac{3}{4}$ inches.

Code Word	No.	List per 100
<i>Bandbox.</i>	10378—Feed-In Yoke, Bronze, $\frac{3}{8}$ -inch Stud	\$ 82 50
<i>Bandelet.</i>	10379— “ “ “ $\frac{1}{2}$ “ “	83 70

Grover Feed-In Hanger



BODY of Hanger is bell-shaped at bottom, thus protecting threaded portion of bolt from weather.

Solid wire or cable not larger than $\frac{3}{8}$ inch in diameter can be used.

Code Word	No.	List per 100
<i>Bandil.</i>	2417—Feed-In Hanger, Bronze, $\frac{3}{4}$ -inch Sherardized Stud	\$105 60
<i>Bandog.</i>	6973—“ “ “ “ “ “ “ “	110 00

Syracuse Feed-In Yoke



END lugs are tinned on inside so that if desired suspension may be soldered to wire.

Intended for use with wire or cable not greater than $\frac{9}{16}$ inch in diameter.

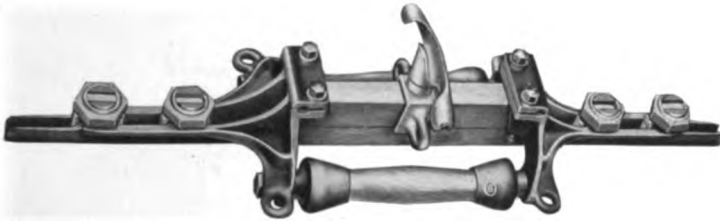
Lower surface, which bears against top of boss of ear, is $1\frac{3}{8}$ inches in diameter, providing a good contact between ear and yoke.

Code Word	No.	List per 100
<i>Bandon.</i>	3197—Feed-In Yoke, Bronze, $\frac{3}{4}$ -inch Sherardized Stud	\$ 50 15
<i>Bandore.</i>	6974—“ “ “ “ “ “ “ “	52 20

For listing of above device in malleable iron, see page 77.

Type A Section Insulator

Form 1—Bronze—750 Volts



No. 9956

TWO substantial end castings of bronze terminate in grooved ends for attachment to trolley wire and are held together by two 1 1/4-inch Wood Strain Insulators, giving 5 inches of insulation.

Entire pull of trolley wires is sustained by Wood Strain Insulators, making a very strong construction. Wood Strains are in the same plane as trolley wire and there is no tendency of device to buckle.

Suspension and runner bars are separate pieces of impregnated and varnished hard wood and fit into sockets in end castings, runner bar being held in place by two cotter pins which pass through holes drilled in the end castings.

A feeder wire connection for 2-0 to 4-0 solid or stranded feeder wire is provided on top of each end casting.

Wooden runner piece is easily replaced when necessary by simply removing cotter pins.

No. 9956 is provided with a suspension yoke for attaching to cross-span wire, a 3/8-inch threaded boss for attaching to hanger stud and a pair of eyes with holes 1/2 x 1 inch for fastening to guy wires. No. 11889 is without the suspension yoke but has the tapped boss and eyes.

Holes in eyes on end castings are 1/2 inch in diameter.

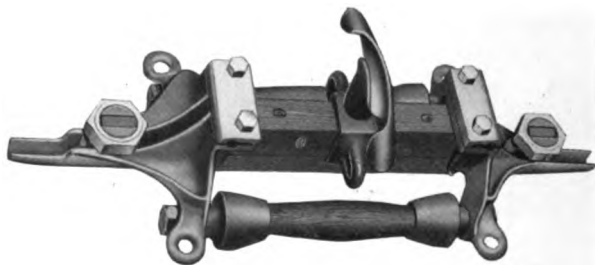
Length overall, 29 7/8 inches; suspension bar, 1 1/2 x 1 1/8 x 9 7/8 inches; runner piece, 1 9/16 x 1 1/8 x 9 7/8 inches.

Code Word	No.	List Each
<i>Birchen.</i>	9956—Insulator, with Suspension Yoke, for 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	\$ 12 65
<i>Milleped.</i>	11889—Insulator, without Suspension Yoke, for 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	12 40
<i>Birlaw.</i>	9957—Runner Piece.....	55

Can be furnished with renewable bronze tips on special order. Boss can be furnished tapped for 3/4-inch stud, if so ordered. This Insulator for use on 1500-volt work is shown on page 86.

Type A Section Insulator

Form 2—Bronze—750 Volts



No. 11038

SIMILAR in design to the Form 1 Insulator listed on preceding page but is lighter, being intended for use on 0 and 2-0 wires while the Form 1 is recommended for 3-0 and 4-0 wires.

End castings are lighter than in Form 1 and have one clamping nut and wedge each.

Strain is borne by two 1-inch Wood Strain Insulators giving 5 inches of insulation.

Feeder wire connection on each end piece will accommodate 2-0 to 4-0 solid or stranded feeder wire.

No. 11038 is provided with a suspension yoke for attaching to cross-span wire, a $\frac{3}{8}$ -inch threaded boss for attaching to hanger stud and a pair of eyes with holes $\frac{1}{2} \times 1$ inch for fastening to guy wires. No. 11039 is without the suspension yoke but has the tapped boss and eyes.

Holes in eyes in end pieces are $\frac{1}{2}$ inch in diameter.

Length overall, $20\frac{1}{2}$ inches; suspension bar, $1\frac{1}{2} \times 1\frac{1}{8} \times 9$ inches; runner piece, $1\frac{9}{16} \times 1\frac{1}{8} \times 9$ inches.

Code Word	No.	List Each
<i>Millet.</i>	11038—Insulator, with Suspension Yoke, for 0 and 2-0 Round, Fig. 8, and Grooved Wires.....	\$9 45
<i>Milltonic.</i>	11039—Insulator, without Suspension Yoke, for 0 and 2-0 Round, Fig. 8 and Grooved Wires.....	9 25
<i>Mimetile.</i>	11556—Runner Piece.....	35

Type C Section Insulator

Patent Applied For

Malleable Iron—With Renewable Bronze Tips

750 Volts



Nos. 11900-11902

USED to insulate one section of trolley wire from another and afford a smooth passage for trolley wheel.

Consists of a substantial second-growth hickory beam, impregnated and varnished, to which are attached sherardized malleable iron end castings having renewable bronze tips.

Wires are fastened to end pieces by means of "U" Bolts. Bronze tips are inserted under hooks upside down with tips pointed toward center and are forced over and outward until lips encircle wires. Cam action of tips forces the wires into bottom of grooves and holds them securely in place.

Runner piece is made of fibre and may be renewed by simply removing two bolts.

Nos. 11900-11902 are provided with a suspension yoke for attachment to cross-span wire, a $\frac{1}{2}$ -inch threaded boss for attaching to hanger stud and a pair of eyes with holes $\frac{1}{4}$ inch in diameter for fastening to guy wires. Nos. 11903-11905 are without the suspension yoke but have the tapped boss and eyes.

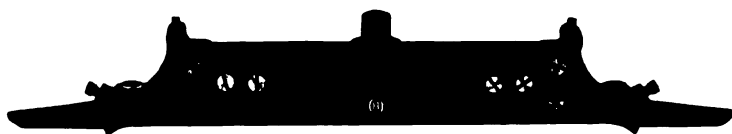
Length overall, 38 inches; length break, 7 inches.

Code Word	No.	List Each
<i>Middling.</i>	11900—Insulator with Suspension Yoke for 0 and 2-0 Round and Grooved Wires.....	\$7 70
<i>Midgard.</i>	11901—Insulator with Sus. Yoke for 3-0 R'd and G'v'd Wires.....	8 25
<i>Midland.</i>	11902— " " " " 4-0 " " " "	8 80
<i>Midmost.</i>	11903—Insulator without Suspension Yoke for 0 and 2-0 Round and Grooved Wires.....	7 50
<i>Midship.</i>	11904—Insulator without Sus. Yoke for 3-0 R'd and G'v'd Wires.....	8 05
<i>Midward.</i>	11905— " " " " 4-0 " " " "	8 60
<i>Midway.</i>	11906—Runner Piece, with Clips.....	65
<i>Jestling.</i>	11275—Renewable Bronze Tip for 0 and 2-0 Round and Grooved Wires.....	55
<i>Jeterus.</i>	11276— " " " " 3-0 Round and Grooved Wires.....	55
<i>Jettison.</i>	11277— " " " " 4-0 " " " "	55

Fibre and Wood Section Insulators

For Round, Figure 8 and Grooved Wires

Bronze—750 Volts



No. 4145—Insulator with Fibre Break

PROVIDED with either white fibre or impregnated and varnished hard wood insulation, 12 inches long, to which are attached bronze end castings.

A feeder lug is provided on each end casting drilled for a 2-0 to 4-0 solid or stranded feeder wire.

Intended to be supported by some form of straight line hanger by means of suspension boss tapped for $\frac{5}{8}$ -inch stud. Length overall, 25 $\frac{1}{2}$ inches; height, 3 $\frac{7}{8}$ inches; set screws, $\frac{1}{2}$ x1 inch.

With Fibre Insulation

Code Word	No.		List Each
<i>Beseech.</i>	3193—	Section Insulator for 0 Round Wire	\$6 60
<i>Besought.</i>	4143—	" " 2-0 " "	6 60
<i>Besiege.</i>	4144—	" " 3-0 " "	6 60
<i>Betoken.</i>	4145—	" " 4-0 " "	6 60
<i>Betrayed.</i>	4146—	" " 0 Fig. 8	6 60
<i>Betwixt.</i>	4147—	" " 2-0 " 8	6 60
<i>Beverage.</i>	4148—	" " 3-0 " 8	6 60
<i>Bewilder.</i>	4149—	" " 4-0 " 8	6 60
<i>Bewitch.</i>	4150—	" " 2-0 Grooved "	6 60
<i>Biblical.</i>	4151—	" " 3-0 " "	6 60
<i>Bickern.</i>	4152—	" " 4-0 " "	6 60
<i>Bicuspid.</i>	3195—	Fibre Break	1 65

With Wood Insulation

<i>Bidental.</i>	5720—	Section Insulator for 0 Round Wire	\$5 70
<i>Biferous.</i>	5721—	" " 2-0 " "	5 70
<i>Biform.</i>	5722—	" " 3-0 " "	5 70
<i>Bigamy.</i>	5723—	" " 4-0 " "	5 70
<i>Bigoted.</i>	5724—	" " 0 Fig. 8	5 70
<i>Billet.</i>	5725—	" " 2-0 " 8	5 70
<i>Billiard.</i>	5726—	" " 3-0 " 8	5 70
<i>Binary.</i>	5727—	" " 4-0 " 8	5 70
<i>Binnacle.</i>	5728—	" " 2-0 Grooved "	5 70
<i>Biology.</i>	5729—	" " 3-0 " "	5 70
<i>Biometry.</i>	5730—	" " 4-0 " "	5 70
<i>Biramous.</i>	5719—	Wood Break	90

Boss can be furnished tapped for $\frac{3}{4}$ -inch stud if so ordered.

Miami Section Insulator

For Round, Figure 8 and Grooved Wires

Bronze—750 Volts



BODY portion is a heavy block of thoroughly seasoned hickory impregnated and varnished to which bronze end castings are securely bolted. The outer ends of these castings are grooved at bottom to receive trolley wire, which is fastened in place by means of set screws.

Lips on end castings are arranged to clinch under wire after the latter is in place.

Runner piece is hard wood impregnated and varnished, and is arranged so as to be easily removed and replaced. A feeder lug is provided on each end casting drilled for a 2-0 to 4-0 B. & S. solid or stranded feeder wire. Set screws holding feeder wire are at an angle of 45 degrees so as to be easily accessible.

Has a straight under-run and offers a smooth passage for the trolley.

Provided with a suspension boss tapped for a $\frac{5}{8}$ -inch stud bolt and is designed to be supported by some form of straight line hanger.

Length overall $29\frac{1}{4}$ inches; height, 5 inches; set screws, $\frac{3}{8} \times \frac{1}{8}$ inch.

Code Word	No.					List Each
<i>Behest.</i>	5805—	Section Insulator for	0	Round Wire		\$7 70
<i>Belfry.</i>	5806—	"	"	2-0	"	7 70
<i>Bellow.</i>	5807—	"	"	3-0	"	7 70
<i>Bemoan.</i>	5808—	"	"	4-0	"	7 70
<i>Benelict.</i>	5809—	"	"	0	Fig. 8	7 70
<i>Benefic.</i>	5810—	"	"	2-0	" 8	7 70
<i>Benign.</i>	5811—	"	"	3-0	" 8	7 70
<i>Benumb.</i>	5812—	"	"	4-0	" 8	7 70
<i>Bequeath.</i>	5813—	"	"	2-0	Grooved	7 70
<i>Bequest.</i>	5814—	"	"	3-0	"	7 70
<i>Bereave.</i>	5815—	"	"	4-0	"	7 70
<i>Berry.</i>	5804—	Runner Piece				35

Boss can be furnished tapped for $\frac{3}{4}$ -inch Stud if so ordered.

Miami Section Insulator with Switch

For Round, Figure 8 and Grooved Wires

Bronze—750 Volts



SAME design as our Miami Section Insulator listed on the preceding page, with the addition of a knife switch mounted on the side for closing the trolley circuit around the insulator.

The device is intended for use in mines where it is desired to keep any section of the trolley alive only when a locomotive is operating in it. The insulator should be mounted so that the motion of the switch in closing is in the direction of traffic entering the dead section. This enables the motorman to throw the switch without leaving the cab and without stopping the locomotive either entering or leaving the dead section.

The contact clips are interchangeable and bolted upon the center portion so that it is easy to change them around and thus reverse the operating direction of the handle, if desired.

The switch handle projects out from the insulator when the switch is closed and the connecting wires are insulated, thus eliminating danger from contact with the live terminal.

The switch and its connections with the feeder lugs have a carrying capacity equal to that of 4-0 copper wire. All wood parts are impregnated and varnished.

Length overall is $29\frac{1}{4}$ inches; height, 5 inches; set screws $\frac{3}{8} \times \frac{1}{2}$ inch; and boss is tapped for a $\frac{3}{8}$ -inch stud.

Code Word	No.						List Each
<i>Heirloom.</i>	10606—	Section Insulator with Switch, for	2-0 Round Wire.....	\$12	10		
<i>Heirship.</i>	10607—	" " " " " " 3-0 " " " " " "		12	10		
<i>Helena.</i>	10608—	" " " " " " 4-0 " " " " " "		12	10		
<i>Helic.</i>	10609—	" " " " " " 0 Fig. 8 " " " " " "		12	10		
<i>Helicin.</i>	10610—	" " " " " " 2-0 " 8 " " " " " "		12	10		
<i>Helicoid.</i>	10611—	" " " " " " 3-0 " 8 " " " " " "		12	10		
<i>Helicon.</i>	10612—	" " " " " " 4-0 " 8 " " " " " "		12	10		
<i>Helio.</i>	10613—	" " " " " " 2-0 Grooved " " " " " "		12	10		
<i>Helium.</i>	10614—	" " " " " " 3-0 " " " " " "		12	10		
<i>Helix.</i>	10615—	" " " " " " 4-0 " " " " " "		12	10		
<i>Berry.</i>	5804—	Runner Piece				35	

Boss can be furnished tapped for $\frac{3}{8}$ -inch Stud if so ordered.

Type M Mine Section Insulator Switch

Patent Applied For



Fig. 1—Switch Closed

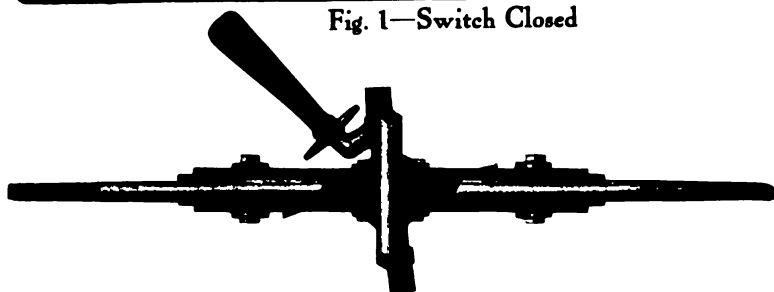


Fig. 2—Switch Open

USED in mines where it is desired to have current in any section of the trolley wire only when a locomotive is operating there. Switch is closed by locomotive driver when entering the section and opened on leaving it.

Consists of an impregnated and varnished second growth hickory beam to which are connected bronze end castings and a pivotal sherardized malleable iron center section equipped with a copper switch blade. When closed as shown in Fig. 1, the end castings are electrically connected by the switch blade and runner piece and an unbroken metallic under-run is provided for trolley wheel. In the open position (Fig. 2) ends are insulated from each other. Switch is operated by substantial hard wood handle provided with a heavy fibre washer which protects the operator from contact with live parts.

Metallic under-run allows locomotive to operate under Insulator with current on and without arcing or sudden rush of current to motors which would be experienced under similar conditions with an ordinary section insulator with insulated center.

Fastened to mine roof by two $\frac{3}{8}$ -inch bosses, giving a rigid construction.

Feeder lugs will take 4-0 solid or smaller wires. Capacity of switch is ample for any current that will be carried by trolley wire.

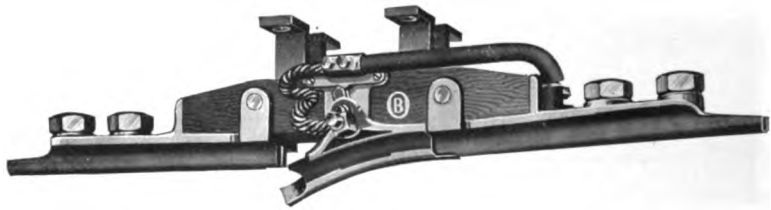
Length overall, 30 inches; height, $5\frac{1}{2}$ inches; set screws, $\frac{3}{8} \times \frac{1}{4}$ inch.

Code Word	No.	List Each
<i>Minaret.</i>	11631—Section Insulator Switch, for 2-0 Round and Grooved Wires	\$12 10
<i>Mincer.</i>	11600— " " " " 4-0 " " " "	12 10
<i>Minerva.</i>	11632— " " " " 2-0 Fig. 8 Wire	12 10
<i>Minibus.</i>	11633— " " " " 4-0 " 8 " "	12 10

Automatic Mine Section Insulator

For Round, Figure 8 and Grooved Wires

750 Volts



IN TENDED for use in mines where it is desired to keep the trolley on any section alive only when a locomotive is operating in that section. The function of the device is to automatically close the circuit as locomotive enters upon the section and to open it as locomotive passes out.

Switch mechanism is operated by pressure of trolley wheel against central rocker portion, and switch is so arranged that circuit is not opened or closed except when no current is being drawn through the switch. This does away with destructive arcing and burning of the switch contacts.

Attachment can be made directly to mine roof timbers by means of braces shown on top. Trolley wires are attached rigidly to each of the end castings by means of two heavy clamps.

Can also be used on overhead construction where it is desired to maintain a trolley section which is not used frequently and upon which current is to be maintained only when a car is operating on that section.

Length overall is 30 inches and height is 5 inches.

Holes for lag screws or bolts in support castings are $\frac{7}{8}$ inch in diameter. Long distance between centers of holes is $10\frac{1}{2}$ inches and short distance $3\frac{1}{4}$ inches.

Code Word	No.	List Each
<i>Biscotin.</i>	9034—Section Insulator for Nos. 0, 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.	\$16 75
<i>Bisect.</i>	9035—Switch Clips and Screws	15
<i>Bisque.</i>	9036—Locking Springs.....	10

In ordering specify size and style of Wire with which it is to be used.

90° Live Rigid Cross-Over

All Bronze



Code Word	No.	List Each
<i>Blackish.</i>	10372—Right Angle Cross-Over, Bronze, for 0, 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	\$6 20

8°-15°-35° Live Rigid Cross-Overs

All Bronze



No. 10382—8° Cross-Over

THE 8 degree Cross-Over is furnished with four pull-off eyes and two tapped bosses as illustrated. The 15 and 35 degree Cross-Overs are provided with only two pull-off eyes at the center and have no tapped bosses.

Overall length of 8 degree is 32 inches; of 15 degree, 21 inches; of 35 degree, 16 inches.

Code Word	No.	List Each
<i>Blamable.</i>	10382—Cross-Over, 8° Angle, Bronze, for 0, 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	\$10 70
<i>Blanch.</i>	10383—Cross-Over, 15° Angle, Bronze, for 0, 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	7 80
<i>Minish.</i>	11684—Cross-Over, 35° Angle, Bronze, for 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	4 75

The 8° Angle Cross-Over may be used for 6° to 10° Angles, and the 15° Angle Cross-Over may be used for 10° to 20° Angles.

Cross-Overs for other Angles can be furnished on special order.

Type A Insulated Adjustable Cross-Over

All Bronze—750 Volts

Forms 1-4

MADE of bronze and insulation is provided by a bar of thoroughly seasoned hickory, impregnated and varnished.

Provided with renewable runner pieces and has a perfectly straight under-run.

The live crossings are strengthened to prevent buckling and wire is held in grooved extensions by clamping wedges.

Installation is quickly and easily accomplished as it is not necessary to cut trolley wires.

A wide range of angular adjustment is possible, the Cross-Overs being adaptable to any angle between 45 and 90 degrees.

Form 1



Code Word
Bistort.

No.

9984—Cross-Over, Form 1, for 0 to 4-0 Round, Fig. 8 and Grooved
Wires.....

List Each

\$13 20

Can be furnished with renewable bronze tips on special order.

Type A Insulated Adjustable Cross-Over

All Bronze—750 Volts

Form 2



For two live parallel trolley wires crossing a dead one.

Code Word	No.	List Each
<i>Biting.</i>	9985—Cross-Over, Form 2, for 0, 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	\$25 30

Form 3



For crossing two dead parallel trolley wires over a live one.

Code Word	No.	List Each
<i>Bitter.</i>	9986—Cross-Over, Form 3, for 0, 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	\$33 00

Form 4



For two live and two dead parallel trolley wires crossing each other.

Code Word	No.	List Each
<i>Bivious.</i>	9987—Cross-Over, Form 4, for 0, 2-0, 3-0 and 4-0 Round, Fig. 8 and Grooved Wires.....	\$48 40

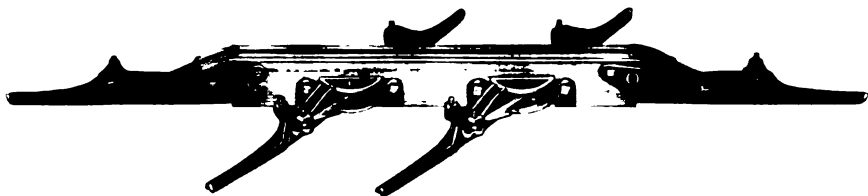
Can be furnished with renewable bronze tips on special order.

In ordering Cross-Overs state the Angle of crossing and the separation between the parallel Trolley Wires.

Type B Insulated Adjustable Cross-Over

Patent Applied For

Malleable Iron—With Renewable Bronze Tips

Form 2—750 Volts

SIMILAR in design to the Type B, Form 1, Cross-Over listed on preceding page, having sherardized malleable iron pan and end castings and one piece renewable bronze tips, but arranged for use where two live parallel trolley wires cross a dead trolley wire.

Cross runners are pivotally attached so that device can be adjusted to any angle from 50 to 90 degrees.

Wood runner pieces are held in place by square head machine bolts and can be easily renewed when necessary.

Each pan has two $\frac{1}{2}$ -inch holes on each side for attachment of guy wires.

When it is not desired to insulate the parallel trolley wires from each other minimum separation between them is 7 inches. When it is necessary to insulate two parallel trolley wires from each other separation between trolley wires will vary according to difference in voltage between them, but 11 inches of separation is sufficient for ordinary conditions, as this distance allows 4 inches of wood between the pan castings.

When ordering always give separation required and if insulation is desired between parallel trolley wires state voltage between them.

Length overall of insulated member is 48½ inches to which should be added the desired separation between the two parallel trolley wires. Length overall of live members is 27½ inches. Lips of bronze tips are 7 inches in length.

Code Word	No.	List Each
<i>Interbrain.</i>	11088—Cross-Over for 0 and 2-0 Round and Grooved Wires	\$23 10
<i>Interceder.</i>	11089—“ “ 3-0 Round and Grooved Wires	23 10
<i>Intercloud.</i>	11090—“ “ 4-0 “ “ “ “	23 10
<i>Inertia.</i>	10864—Renewable Bronze Tip for 0 and 2-0 Round and G'y'd Wires	75
<i>Inesse.</i>	10865—“ “ “ “ 3-0 Round and Grooved Wires	75
<i>Inexist.</i>	10866—“ “ “ “ 4-0 “ “ “ “	80

These Cross-Overs can be furnished for use with Figure 8 Wire on request.

Type C Live Adjustable Cross-Over

All Bronze

Form 1—With Deflector Bars



USED at trolley wire crossings where it is not desired to insulate wires from each other and where the angle of crossing is not less than 30 degrees, and on account of its low height it is equally well adapted for both railway and mine service.

Ease of installation was carefully considered in making up the design. Pan and cross runner castings are interlocked and held together without aid of screws or bolts. One piece clamping wedges have great holding power. It is not necessary to cut wires in installing.

The deflector bars are sherardized malleable iron and are for the purpose of drawing the trolley harp down and preventing it from becoming caught in case the wheel leaves the wire. When the Cross-Overs are installed at a 60 to 90 degree angle crossing the deflector bars are not needed and the Form 2 Cross-Over listed on the following page is recommended.

The device offers a perfectly smooth under-run for both shallow and deep groove trolley wheels. It will resist a breaking strain of 4-0 wire without buckling and has ample metal in the pan to insure long life.

Height overall, 4 inches; length overall, 17 inches. Holes $\frac{1}{2}$ inch in diameter are provided in the pan casting for guy wires.

Code Word	No.	List Each
Hederic.	10863—Cross-Over for 0 and 2-0 Round, Grooved and Fig. 8 Wires	\$8 65
Hedge.	10634—“ “ 3-0 “ 4-0 “ and Grooved Wires	8 65
Hedonic.	10635—“ “ 3-0 “ 4-0 Fig. 8 Wire	8 65

Type C Live Adjustable Cross-Over

All Bronze

Form 2—Without Deflector Bars



SAME as the Form 1 listed on the preceding page, except that the deflector bars are omitted.

The Form 2 is recommended for use at 60 to 90 degree crossings only since, under those conditions, there is no danger of a flying trolley harp becoming "wedged." For angles less than 60 degrees the Form 1 Cross-Over listed on the preceding page, should be specified.

On account of its low height it is equally well adapted for both railway and mine service.

Ease of installation was carefully considered in making up the design. It is not necessary to cut wires.

Pan and cross runner castings are interlocked and held together without aid of screws or bolts. One piece clamping wedges have great holding power.

Offers a perfectly smooth under-run for both shallow and deep grooved trolley wheels. It will resist a breaking strain of 4-0 wire without buckling and has ample metal in pan to insure long life.

Height overall, 4 inches; length overall, 17 inches. Holes $\frac{1}{2}$ inch in diameter are provided in pan casting for guy wires.

Code Word	No.	List Each
<i>Innew.</i>	10962—Cross-Over for 0 and 2-0 Round, Grooved and Fig. 8 Wires...	\$8 25
<i>Innately.</i>	10963— " " 3-0 " 4-0 " and Grooved Wires.....	8 25
<i>Innative.</i>	10964— " " 3-0 " 4-0 Fig. 8 Wire.....	8 25

Type D Live Adjustable Cross-Over

Patent Applied For

Malleable Iron—With Renewable Bronze Tips

Form 2—Without Deflector Bars



SAME design as the Form 1 listed on the preceding page, except that the deflector bars are omitted.

The Form 2 is recommended for use at 60 to 90 degree crossings only since, under those conditions, there is no danger of the harp becoming "wedged." For angles less than 60 degrees the Form 1 Cross-Over listed on the preceding page should be specified.

It consists of sherardized malleable iron pan and cross runner castings and renewable bronze tips, and has exceptional wearing qualities which make it better suited than an all bronze device for use under heavy service conditions.

Pan and cross runner castings interlock and are held together without use of any screws, bolts or pins. They are made heavy enough to provide for long life, and heavy malleable iron compression bars prevent buckling and provide ample space for the wire under them.

The one-piece clamping wedges have great holding power.

Renewable bronze tips are 7 inches in length, and provide flexibility and prevent crystallization of the wire, which sometimes occurs when wire is attached directly to a heavy rigid casting.

Can be installed without cutting wires.

Height, 4 inches; length overall, 28½ inches.

Code Word	No.		List Each
<i>Innovation.</i>	10987—	Cross-Over for 0 and 2-0 Round and Grooved Wires	\$6 60
<i>Innovator.</i>	10988—	" " 3-0 Round and Grooved Wires	6 60
<i>Innuent.</i>	10989—	" " 4-0 " " " " " " " " " " " " " "	6 60
<i>Inertia.</i>	10864—	Renewable Bronze Tip for 0 and 2-0 Round and G'v'd Wires .	75
<i>Inesse.</i>	10865—	" " " " 3-0 Round and Grooved Wires	75
<i>Inexist.</i>	10866—	" " " " 4-0 " " " " " " " " " "	80

These Cross-Overs can be furnished for use with Figure 8 Wire on request.

Type E Live Adjustable Cross-Over

Patent Applied For

Malleable Iron—With Renewable Bronze Tips

Form 1—With Deflector Bars



FOR use at trolley wire crossings of from 30 to 60 degrees where it is not desired to insulate the wires from each other.

Malleable iron deflector bars prevent a flying trolley harp from being caught.

Malleable iron pan and cross runner castings interlock and are held together without the use of screws or bolts.

Wires are held in bottom of grooves and prevented from slipping by cam action of renewable bronze tips.

It is not necessary to cut wires to install; simply lay wires in place, insert compression bars at center and attach renewable tips.

All malleable iron parts are sherardized.

Overall dimensions are: height, $3\frac{1}{2}$ inches; length, $23\frac{1}{2}$ inches.

Code Word	No.	List Each
<i>Misaimed.</i>	11915—Cross-Over for 0 and 2-0 Round and Grooved Wires.....	\$6 00
<i>Misalter.</i>	11916—“ “ 3-0 Round and Grooved Wires.....	6 00
<i>Miscall.</i>	11917—“ “ 4-0 “ “ “ “ “ “.....	6 00
<i>Jesting.</i>	11275—Renewable Bronze Tip for 0 and 2-0 Round and G'v'd Wires.	55
<i>Jeterus.</i>	11276—“ “ “ “ 3-0 Round and Grooved Wires.....	55
<i>Jettison.</i>	11277—“ “ “ “ 4-0 “ “ “ “ “ “.....	55

These Cross-Overs can be furnished for use with Figure 8 Wire on request.

O-B Trolley Frogs

IN the O-B Frogs listed on the following pages the designation "right-hand," "left-hand," etc., indicates the direction of the turnout. For ordinary city service, with turnout radii not exceeding 50 feet, the 20° frogs are suitable, but with the longer radii introduced by suburban and interurban work, smaller divergence angles are necessary, and the employment of high speeds has necessitated the use of longer pans to allow overcoming the inertia of the trolley wheel in transition between the inner ends of tongues.

The following table gives range of distance from track switch point to track frog with which each set of trolley frogs may be most satisfactorily used:

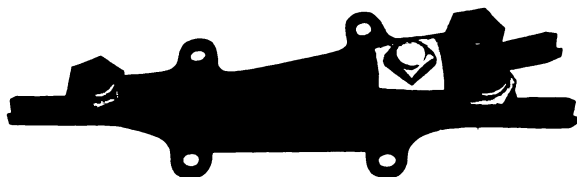
Frog Distance	Divergence Angle of Trolley Frog
Up to 22 feet.....	20°
From 20 to 30 feet.....	15°
Above 28 feet.....	8°

The minimum frog distance given in the table, with which the 15° frogs may be used to best advantage, corresponds to a turnout radius of 40 feet, but when suburban cars using high speed trolley wheels run over city tracks it is advisable to use 15° rather than 20° frogs throughout the city construction, even where the minimum frog distance is less than 20 feet.

In order to insure smooth transition of the wheel between tongue and pan, the pans of all O-B Frogs have, at each end, an inclined plane rising at a very acute angle from the horizontal, which receives the flange of the wheel at a point depending upon the depth of the wheel groove, the depth of tongues and rise of the inclined plane admitting the use of a groove depth from $\frac{3}{4}$ to $1\frac{1}{8}$ inches.

Type A Trolley Frogs

All Bronze



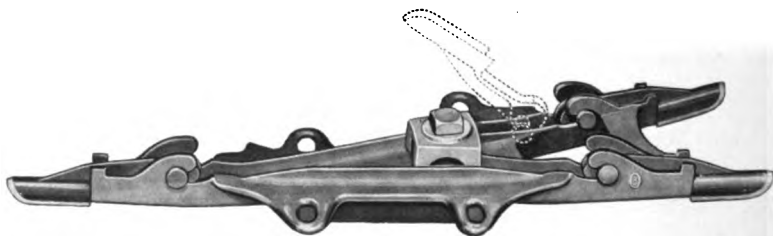
Code Word	No.	List Each
<i>Camping.</i>	10527—Right-hand Frog, 20° angle, for 0 and 2-0, Round, Fig. 8 and Grooved Wires.....	\$ 4 60
<i>Blandly.</i>	10013—Right-hand Frog, 20° angle, for 3-0 and 4-0, Round, Fig. 8 and Grooved Wires.....	4 95
<i>Campus.</i>	10528—Left-hand Frog, 20° angle, for 0 and 2-0, Round, Fig. 8 and Grooved Wires.....	4 60
<i>Blarney.</i>	10014—Left-hand Frog, 20° angle, for 3-0 and 4-0, Round, Fig. 8 and Grooved Wires.....	4 95
<i>Canard.</i>	10529—V Frog, 20° angle, for 0 and 2-0, Round, Fig. 8 and Grooved Wires.....	4 60
<i>Blatter.</i>	10385—V Frog, 20° angle, for 3-0 and 4-0, Round, Fig. 8 and Grooved Wires.....	4 95
<i>Blazing.</i>	10015—Right-hand Frog, 15° angle, for 0 to 4-0 inclusive, Round, Fig. 8 and Grooved Wires.....	5 70
<i>Bleach.</i>	10016—Left-hand Frog, 15° angle, for 0 to 4-0 inclusive, Round, Fig. 8 and Grooved Wires.....	5 70
<i>Bleakish.</i>	10386—V Frog, 15° angle, for 0 to 4-0 inclusive, Round, Fig. 8 and Grooved Wires.....	5 70
<i>Blender.</i>	8685—Right-hand Frog, 8° angle, for 0 to 4-0 inclusive, Round, Fig. 8 and Grooved Wires.....	7 25
<i>Blight.</i>	8686—Left-hand Frog, 8° angle, for 0 to 4-0 inclusive, Round, Fig. 8 and Grooved Wires.....	7 25
<i>Blinder.</i>	8687—V Frog, 8° angle, for 0 to 4-0 inclusive, Round, Fig. 8 and Grooved Wires.....	8 00
<i>Blinkard.</i>	8642—Three-way Frog, 15° angle, for 0 to 4-0 inclusive, Round, Fig. 8 and Grooved Wires.....	10 70

In ordering Frogs specify the angle desired.

Type D Trolley Frog

Patent Applied For

Forms 1 and 2



CONSISTS of only six parts—pan casting, clamping piece, clamping bolt and three bronze combination tip and cam wedge castings.

Form 1 has a malleable iron and Form 2 has a bronze pan casting, otherwise the two forms are identical.

Installation is accomplished with a minimum amount of time because of few operations necessary.

Wires are clamped to pan by tightening nut on central clamp casting.

End pieces are then inserted under hooks upside down with tips pointed toward center of pan and are forced over and outward until lips encircle the wires, the cams meantime, forcing wires into bottom of grooves and holding them securely in place.

Lips are then clinched around wires and operation is completed.

Clamping arrangement is amply strong for holding wire and cams are designed to force either a new or badly worn old wire into bottom of groove.

Pan offers a smooth under-run for all sizes of trolley wheels. Sides are flared outwardly at the ends to catch wheel and a deflector bar between branch arms prevents wedging of wheel in case it should jump.

Tips have lips $2\frac{1}{2}$ inches long, ground to a knife edge at outer end and left full thickness at inner to provide an easy approach to pan runner.

Pull-off rings have holes $\frac{1}{2} \times 1$ inch. All iron parts are sherardized.

See listing on following pages.

Type D Trolley Frogs

Patent Applied For

Form 2—All Bronze—With Renewable Tips

Continued

Code Word	No.		List Each
<i>Jigging.</i>	11280—	Right-Hand Frog, 20°, for 0 and 2-0 R'd and G'v'd Wires.....	\$6 00
<i>Jigjog.</i>	11281—	" " 20°, " 3-0 R'd and G'v'd Wires.....	6 00
<i>Jingler.</i>	11282—	" " 20°, " 4-0 " " " ".....	6 00
<i>Jingling.</i>	11283—	" " 20°, " 2-0 Fig. 8 Wire.....	6 00
<i>Jobation.</i>	11284—	" " 20°, " 4-0 " 8 ".....	6 00
<i>Jocantry.</i>	11285—	Left-Hand " 20°, " 0 and 2-0 R'd and G'v'd Wires.....	6 00
<i>Jocose.</i>	11286—	" " 20°, " 3-0 R'd and G'v'd Wires.....	6 00
<i>Jocular.</i>	11287—	" " 20°, " 4-0 " " " ".....	6 00
<i>Jocund.</i>	11288—	" " 20°, " 2-0 Fig. 8 Wire.....	6 00
<i>Joinant.</i>	11289—	" " 20°, " 4-0 " 8 ".....	6 00
<i>Joinery.</i>	11290—	"V" Frog, 20°, for 0 and 2-0 R'd and G'v'd Wires.....	6 00
<i>Jokingly.</i>	11291—	" " 20°, " 3-0 R'd and G'v'd Wires.....	6 00
<i>Jollity.</i>	11292—	" " 20°, " 4-0 " " " ".....	6 00
<i>Jostile.</i>	11293—	" " 20°, " 2-0 Fig. 8 Wire.....	6 00
<i>Jotter.</i>	11294—	" " 20°, " 4-0 " 8 ".....	6 00
<i>Journey.</i>	11295—	Right-Hand Frog, 15°, for 0 and 2-0 R'd and G'v'd Wires.....	6 55
<i>Jovial.</i>	11296—	" " 15°, " 3-0 R'd and G'v'd Wires.....	6 55
<i>Jovially.</i>	11297—	" " 15°, " 4-0 " " " ".....	6 55
<i>Juncate.</i>	11318—	" " 15°, " 2-0 Fig. 8 Wire.....	6 55
<i>Jowler.</i>	11298—	" " 15°, " 4-0 " 8 ".....	6 55
<i>Joyance.</i>	11299—	Left-Hand " 15°, " 0 and 2-0 R'd and G'v'd Wires.....	6 55
<i>Joyful.</i>	11300—	" " 15°, " 3-0 R'd and G'v'd Wires.....	6 55
<i>Joyless.</i>	11301—	" " 15°, " 4-0 " " " ".....	6 55
<i>Juncous.</i>	11319—	" " 15°, " 2-0 Fig. 8 Wire.....	6 55
<i>Joysome.</i>	11302—	" " 15°, " 4-0 " 8 ".....	6 55
<i>Jubate.</i>	11303—	"V" Frog, 15°, for 0 and 2-0 R'd and G'v'd Wires.....	6 55
<i>Jubilant.</i>	11304—	" " 15°, " 3-0 R'd and G'v'd Wires.....	6 55
<i>Jubilar.</i>	11305—	" " 15°, " 4-0 " " " ".....	6 55
<i>Juniper.</i>	11320—	" " 15°, " 2-0 Fig. 8 Wire.....	6 55
<i>Jubilee.</i>	11306—	" " 15°, " 4-0 " 8 ".....	6 55
<i>Jesting.</i>	11275—	Renewable Bronze Tip for 0 and 2-0 R'd and G'v'd Wires.....	55
<i>Jelerus.</i>	11276—	" " " " 3-0 R'd and G'v'd Wires.....	55
<i>Jeltison.</i>	11277—	" " " " 4-0 " " " ".....	55
<i>Jeweler.</i>	11278—	" " " " 2-0 Fig. 8 Wire.....	55
<i>Jewelry.</i>	11279—	" " " " 4-0 " 8 ".....	55

See description on page 206.

Drawbridge Frog

All Bronze



Nos. 11389-11390

USED to provide electrical connection for trolley wire on draw bridges and passage for trolley wheel from one section of wire to the other. Frogs are installed in pairs, so that when bridge is closed, they face each other and contact plates are forced together by springs.

Contact plate is heavy bronze casting, ample to give good contact under varying positions. Under certain conditions the contact plate is not required and Nos. 11391 and 11392 are therefore supplied without the plate and springs.

With Contact Plate

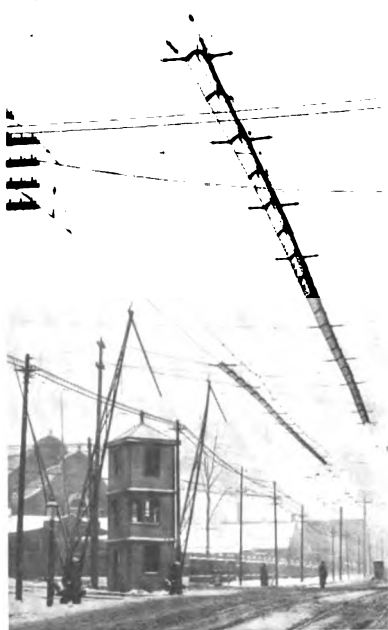
Code Word	No.	List Each
<i>Lactose.</i>	11389—Frog, $\frac{3}{4}$ -inch Bosses, for 0 to 4-0 R'd and G'v'd Wires.....	\$10 54
<i>Lacunar.</i>	11390— “ $\frac{3}{4}$ “ “ 0 to 4-0 “ “	10 54

Without Contact Plate

<i>Ladanum.</i>	11391—Frog, $\frac{3}{4}$ -inch Bosses, for 0 to 4-0 R'd and G'v'd Wires.....	\$7 45
<i>Laddie.</i>	11392— “ $\frac{3}{4}$ “ “ 0 to 4-0 “ “	7 45

National Railroad Trolley Guard

Patented



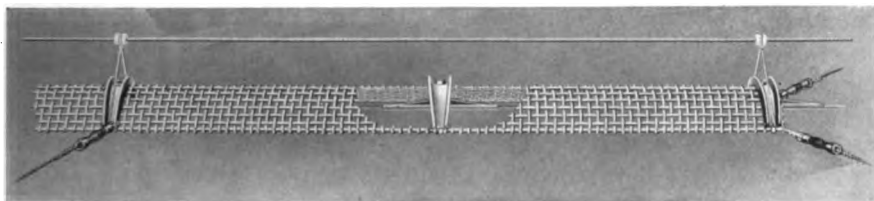
National Guard installed at railroad crossings.

See following pages for description and listing.

National Railroad Trolley Guard

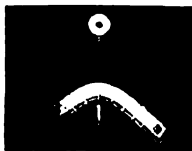
Patented

General Description

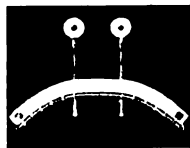


THE necessity for using some type of safety appliance as a trolley guard at steam railroad grade crossings has long been apparent to street railway managers, who wish to fortify their properties to the highest degree against serious accidents. Accidents that result from the stalling of trolley cars on steam road crossings are in the preventable class, and as such are receiving close attention in many states and in time will be covered by legislative enactments.

Owing to various conditions affecting construction, detrolleyments occur most frequently at steam road crossings where the results are most hazardous and National Railroad Trolley Guard offers a positive means of preventing the stalling of cars at such points by furnishing a continuous supply of power should the trolley leave the wire, thus enabling the car to be operated past the danger point.



Single Guard



Double Guard

National Railroad Trolley Guard is the result of years of study and development including consideration of various forms and materials. This type of guard is now in use on about 167 important roads and in quantity totals about 85,000 feet, which installations are giving universal satisfaction.

National Railroad Trolley Guard is installed over the trolley wire of electric railways at steam crossings and consists of one piece of woven galvanized iron or copper wire formed into an inverted trough. When the trolley wheel leaves the wire due to the height of the trolley at the crossings, the unevenness of the track or some other

See listing on page 216.

National Railroad Trolley Guard

Continued

cause, the wheel is caught in the inverted trough from which it receives a continuous supply of current so that the electric car may operate until it is clear of the steam tracks thus preventing accidents due to electric cars becoming stalled at these dangerous points.

In addition to the one piece woven mesh, galvanized steel hangers are supplied for supporting the mesh and holding it in place. Bolts are included to attach the hangers to ordinary trolley ears. A $\frac{5}{16}$ in. galvanized steel strand is recommended for the supporting messenger wire and No. 6 galvanized wire is satisfactory for the side Guy Wires which keep the guard in proper alignment and prevent the guard from

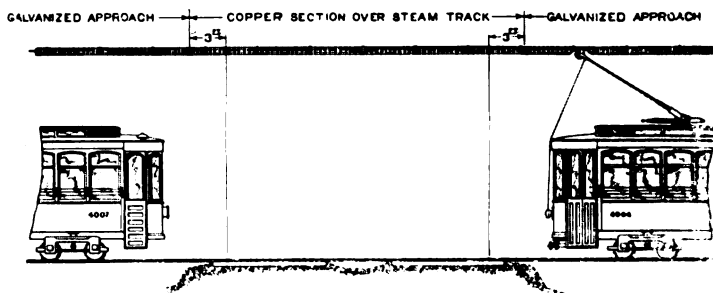


Fig. 1—Showing Copper Section over Steam Road Tracks and Galvanized Approaches

swaying in the wind. Porcelain Spool Insulators may be used on the messenger wire when it is necessary to keep the supporting messenger wire insulated, but under most conditions this insulation is unnecessary.

The Guard is furnished for single trolley and for double trolley with 6 in. separation between wires.

The Guard as regularly supplied includes only the woven mesh, the hangers and the attaching bolts. The trolley ears, strain insulators, supporting messenger and guy wires, are of the regular stock designs used throughout on ordinary overhead installations and are not supplied with the Guard unless specified.

Guard is shipped flat and a forming tool is furnished. Full credit will be allowed if forming tool is returned within six months.

The lightness of the National Guard makes the installation of

See listing on page 216.

National Railroad Trolley Guard

Continued

special supports unnecessary and the open mesh, 1 inch square, offers practically no resistance to severe rain, wind or snow storms, or to the exhaust steam from locomotives passing under the guard. Ice and snow cannot accumulate in undue quantities on this type of guard.

National Railroad Trolley Guard is furnished in three ways:—all-galvanized mesh, all-copper mesh and galvanized approaches with a copper section over the steam track.

The all-galvanized mesh is recommended for branch line steam road crossings where corrosion due to locomotive exhaust is not excessive as under these conditions the galvanized Guard will give satisfactory life.

The all-copper mesh is recommended for heavy service, trunk line steam road crossings where the corrosion is excessive.

For the average crossing, the Guard made up of galvanized approaches with a copper section over the steam tracks and extending three feet outside of the outer steam track rails, is satisfactory as the copper section over the steam road track will resist the excessive corrosion caused by the locomotive exhausts and the galvanized approaches will give a satisfactory life as they are not subjected to such severe conditions. This arrangement is shown in Fig. 1, and the length of each approach and of the copper section, must be given when ordering so that the splices can be made up at the factory and the entire Guard shipped in one piece.

Length of Guard Required

Single Electric Track Crossing Steam Track with Electric Cars Operated in Both Directions

Where the electric railway has single track with cars operated in both directions, the conditions are represented in Fig. 2, in which "A" represents the distance from forward bumper to trolley wheel on longest car. "B" represents the distance between centers of outside steam tracks. This distance varies with the number of steam tracks. The 10 foot dimensions are clearances, giving about 5 feet between the electric car and the widest steam coach. This clearance is necessary on each side of the steam track.

With this condition the proper length of Guard is "A" + 10 ft. + "B" + 10 ft. + "A".

See listing on page 216.

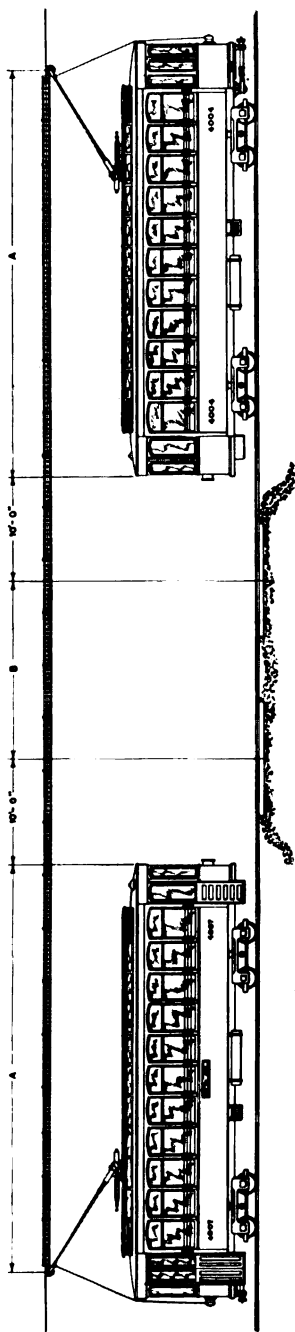
National Railroad Trolley Guard—*Cont.*

Fig. 2—Single Track With Operation in Both Directions

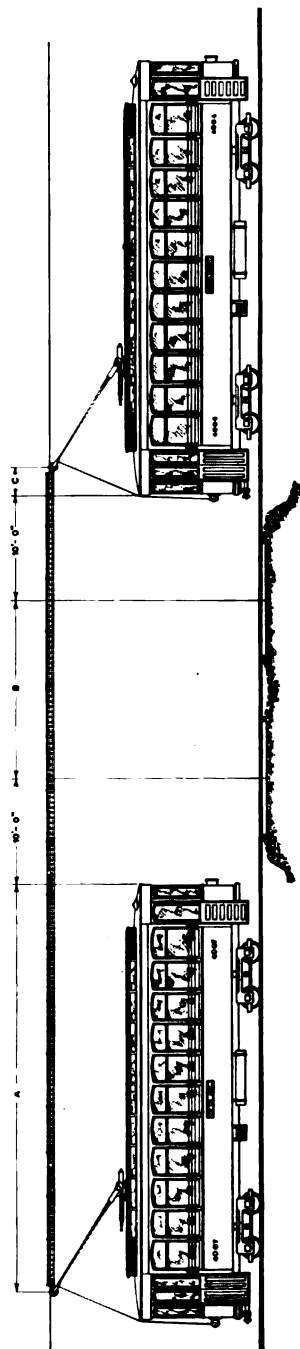


Fig. 3—Single Track With Operation in One Direction Only

See listing on page 216

National Railroad Trolley Guard—*Cont.*

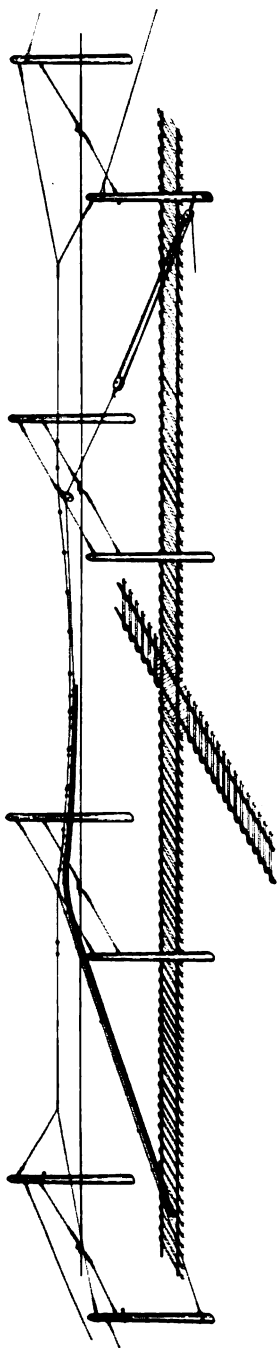


Fig. 4—Showing Method of Sliding Guard into Position

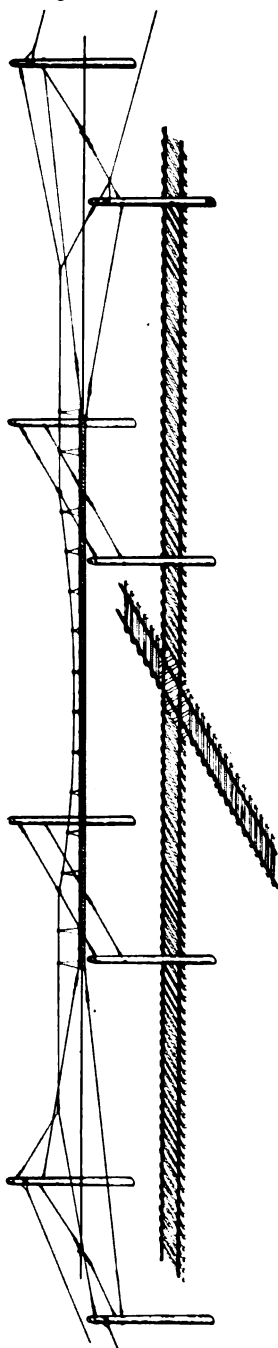


Fig. 5—Showing Completed Installation

See listing on page 216

National Railroad Trolley Guard—Cont.

Single Electric Track Crossing Steam Track with Electric Cars Operated in One Direction Only

Where the electric cars operate over the single track in one direction only, the condition is illustrated in Fig. 3. "A" represents the distance from forward bumper to trolley wheel on the longest car. "B" represents the distance between centers of outside steam tracks. This distance varies with number of steam tracks. "C" is the distance from rear bumper to trolley wheel.

The 10 foot dimensions are clearances giving about 5 feet between the electric cars and the widest steam coach. This clearance is necessary on each side of the steam tracks. The correct length of the Guard for single tracks with electric cars operated in one direction is "A" + 10 feet + "B" + 10 feet + "C".

Double Electric Track Crossing Steam Track with Electric Cars Operated in One Direction on Each Track

Double track operation with cars operated in opposite directions requires the same length of Guard on each track that is required for single track with cars operated in one direction and the length of Guard required for each track would be the same as for Fig. 3. With double track installation the approach "A" is on one side of the steam track for one guard and on the opposite side for the other guard.

Directions for Ordering

In making up an order for National Trolley Guard for a number of crossings, please give length of Guard for each crossing and name of crossing so that each Guard can be made from a single piece of woven mesh of the desired length and be properly tagged for the particular installation at which it is to be used.

For Single Trolley

Code Word	No.		List per Foot
<i>Borough.</i>	9840—	Single Guard, Galvanized Iron, $\frac{1}{4}$ -inch Stud	\$3 30
<i>Bossage.</i>	9841—	" " " " " "	3 30
<i>Bottler.</i>	9844—	" " Copper, " "	4 20
<i>Bouller.</i>	9845—	" " " " " "	4 20

For Double Trolley

<i>Bouquet.</i>	9846—	Double Guard, Galvanized Iron, $\frac{1}{4}$ -inch Stud	\$4 30
<i>Boviform.</i>	9847—	" " " " " "	4 30
<i>Bowable.</i>	9947—	" " Copper, " "	5 70
<i>Bowery.</i>	9948—	" " " " " "	5 70

Guard is regularly furnished in a single piece in any length up to 110 feet but can be made in a single piece as long as 150 feet on special order.

Specification blanks, giving full directions for ordering the National Trolley Guard will be sent on request.

O-B Composition Strain Insulators

750 Volts — Patent Applied For



THE various forms of O-B Composition Strain Insulators listed on this and the following pages all have the same interior construction.

A sherardized malleable iron cup casting is compressed over the head of a second malleable iron casting.

Heavy sheet mica forms an effective insulation between these two castings. All strain is borne by the castings and intervening mica, Dirigo composition simply acting as a weatherproof covering.

The composition is securely locked on by recessed flanges shown in sectional view.

Size of Insulator	Mechanical Routine Test	Average Ultimate Mechanical Strength	Routine Electrical Test	Average Ultimate Electrical Strength
2½ inch	3,500 lbs.	7,000 lbs.	7,000 Volts	14,000 Volts
2¾ inch	4,000 lbs.	9,000 lbs.	7,000 Volts	14,000 Volts

With Two ½-inch Eyes



No. 11526—Length, center to center of eyes is 3¾ inches.

No. 11527—Length, center to center of eyes is 4¾ inches.

Code Word	No.	List per 100
<i>Modicum.</i>	11526—Insulator, 2½-inch diameter, ½-inch eyes, *Sherardized	\$46 20
<i>Modular.</i>	11527— " 2¾ " " ½ " " " " "	63 80

* Eyes will take ½-inch bolts. Eyes can be furnished to order at right angles.

O-B Composition Strain Insulators

750 Volts—Patent Applied For

Continued

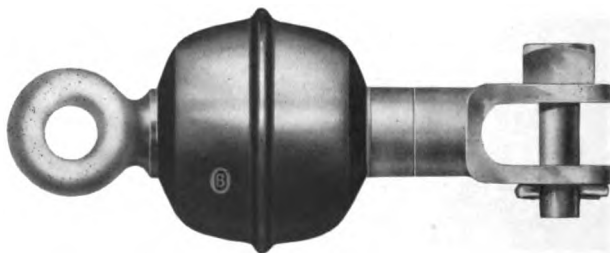
With $\frac{1}{2}$ -inch and $\frac{3}{4}$ -inch Eyes



Length, center to center of eyes is $5\frac{1}{4}$ inches.

Code Word	No.	List per 100
<i>Moggan.</i>	11649—Insulator, $2\frac{1}{4}$ -inch diameter, $\frac{1}{2}$ and $\frac{3}{4}$ -inch eyes, *Sherardized.	\$79 20
* The $\frac{1}{2}$ -inch eye will take a $\frac{1}{2}$ -inch bolt.		

With $\frac{1}{2}$ -inch Eye and Clevis



Opening in clevis is $\frac{3}{4}$ inch; Clevis bolt is $\frac{7}{16} \times 1\frac{5}{8}$ inches in No. 11647 and $\frac{1}{2} \times 1\frac{5}{8}$ inches in No. 11648.

No. 11647, length, center eye to center of clevis bolt is $4\frac{3}{4}$ inches.

No. 11648, length, center eye to center of clevis bolt is $5\frac{7}{8}$ inches.

Code Word	No.	List per 100
<i>Mohair.</i>	11647—Insulator, $2\frac{1}{4}$ -inch diameter, $\frac{1}{2}$ -inch eye and clevis, *Sherardized	\$63 80
<i>Mohawk.</i>	11648— " " " " " " " " " " " "	85 80

*Eye will take a $\frac{1}{2}$ -inch bolt.

See general description on page 217.

O-B Composition Strain Insulators

750 Volts—Patent Applied For

Continued

With Two $\frac{3}{4}$ -inch Eyes



Length, center to center of eyes is $5\frac{3}{4}$ inches.

Code Word
Molecule.

No. List per 100
11699—Insulator, $2\frac{3}{4}$ -inch diameter, $\frac{3}{4}$ -inch Eyes, Sherardized..\$101 20

With $\frac{3}{4}$ -inch Eye and Clevis



Opening in clevis is $\frac{3}{4}$ inch; clevis bolt is $\frac{1}{2} \times 1\frac{5}{8}$ inches.

Length, center of eye to center of clevis bolt is $6\frac{3}{8}$ inches.

Code Word
Molehill.

No. List per 100
11698—Insulator, $2\frac{3}{4}$ -inch diameter, $\frac{3}{4}$ -inch Eye and Clevis,
Sherardized.....\$112 20

See general description on page 217.

O-B Composition Strain Insulators

750 Volts—Patent Applied For

With $\frac{5}{8}$ -inch Tapped End and $\frac{5}{8}$ -inch Stud



Length overall, $2\frac{13}{16}$ inches.

Code Word
Mollify.

No.		List per 100
11701—Insulator, $2\frac{3}{4}$ -inch diameter, $\frac{5}{8}$ -inch Tapped End and $\frac{5}{8}$ -inch Stud, Sherardized.....		\$94 60

With $\frac{5}{8}$ -inch Tapped End and Clevis



Opening in clevis is $\frac{3}{4}$ -inch; clevis bolt is $\frac{1}{2} \times 1\frac{5}{8}$ inches. Length, face of tapped end to center of clevis bolt is $5\frac{1}{4}$ inches.

Code Word
Molybdic.

No.		List per 100
11703—Insulator, $2\frac{3}{4}$ -inch diameter, $\frac{5}{8}$ -inch Tapped End and Clevis, Sherardized.....		\$112 20

See general description on page 217.

O-B Composition Strain Insulators

750 Volts—Patent Applied For

Continued

With $\frac{5}{8}$ -inch Tapped End and Eye



No. 11697, length, face of tap end to center of eye is 4 inches.

No. 11702, length, face of tap end to center of eye is $4\frac{1}{2}$ inches.

Code Word	No.	List per 100
<i>Monachal.</i>	11697—Insulator, $2\frac{3}{4}$ -inch diameter, $\frac{1}{2}$ -inch Tapped End & $\frac{1}{2}$ -inch Eye,* Sherardized.....	\$ 68 00
<i>Monacid.</i>	11702—Insulator, $2\frac{1}{2}$ -inch diameter, $\frac{1}{2}$ -inch Tapped End & $\frac{1}{2}$ -inch Eye, Sherardized.....	103 40

*Eye will take a $\frac{1}{2}$ -inch bolt.

With Two Clevises



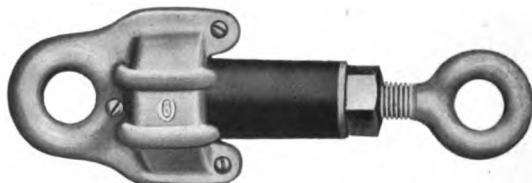
Openings in clevises are $\frac{3}{4}$ inch; clevis bolts are $\frac{1}{2} \times 1\frac{5}{8}$ inches.

Length, center to center of clevis bolts is 7 inches.

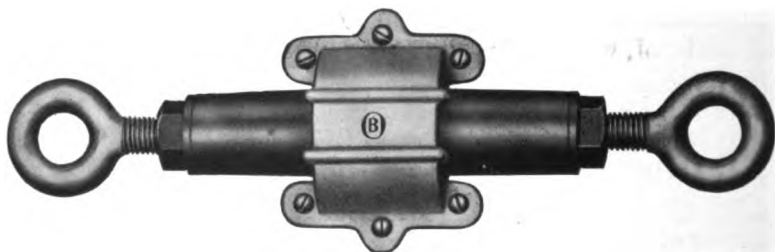
Code Word	No.	List per 100
<i>Monadic.</i>	11700—Insulator, $2\frac{1}{2}$ inch diameter, with two clevises, Sherardized....	\$123 20

Brooklyn Strain Insulators

750 Volts



No. 9995—Single



No. 2539—Double

MALLEABLE iron cap is divided into two equal parts in line with axis of insulator and fastened together around head of Dirigo insulated bolt by heavy round head brass screws.

Insulated bolt is provided with a brass shoulder which bears against cap and protects insulation.

Eye bolts are drop forged and take-up in single insulator is 3 inches; in double, 6 inches.

Holes in $\frac{3}{8}$ -inch Eye Bolts are $\frac{3}{4}$ inch in diameter; in $\frac{1}{2}$ -inch Eye Bolts, 1 inch. Eye in Cap of single Brooklyn is $\frac{1}{4}$ inch in diameter.

Single

Code Word	No.	List per 100
<i>Blouse.</i>	9995—Insulator, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Eye Bolt.	\$112 20
<i>Blubber.</i>	9996— “ “ “ “ $\frac{1}{2}$ “ “	165 00

Double

<i>Bluing.</i>	2539—Insulator, Malleable Iron, Sherardized, $\frac{3}{8}$ -inch Eye Bolt.	\$242 00
<i>Bluster.</i>	2541— “ “ “ “ $\frac{1}{2}$ “ “	352 00

Wood Strain Insulators

750—3,300 Volts

AS a result of proper design, careful selection of materials, improved methods of manufacture and rigid factory tests which are greatly in excess of service conditions, these Wood Strain Insulators are thoroughly reliable and very durable.

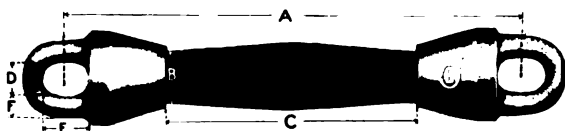
They are made of the best grade of second-growth hickory, impregnated with an insulating compound and varnished to increase the insulating properties and resist the action of the weather.

Sherardized, malleable iron caps are compressed firmly in place around ends of wood. Movement of compressing dies is carefully regulated so that the wood is not injured.

The taper of the ends of the sticks has been carefully worked out to give maximum strength.

Size of Insulator in Inches.....	1	1¼	1½	1¾
Routine Test in lbs.....	4,000	5,000	6,000	7,500
Average Ultimate Strength in lbs..	7,500	10,000	12,500	15,000

With Regular Eyes



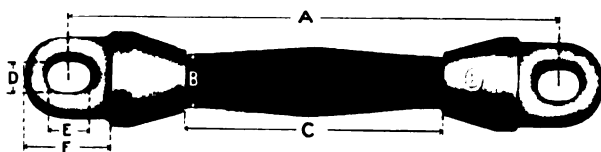
Code Word	No.	Voltage	Dimensions in Inches						List per 100
			A	B	C	D	E	F	
<i>Booster</i>	8574	750	9	1	5	1½	1½	7/16	\$ 33 00
<i>Boasting.</i>	8628	750	9½	1½	5	1½	1	7/16	39 60
<i>Bobbinet.</i>	10384	750	10½	1½	5	1½	1½	7/16	77 00
<i>Heraud.</i>	10860	750	11½	1½	5	1½	1½	7/16	132 00
<i>Bombast.</i>	8622	1500	16	1	12	1½	1½	7/16	44 00
<i>Bonanza.</i>	9237	1500	16½	1½	12	1½	1	7/16	57 20
<i>Boreas.</i>	10301	3300	28½	1½	24	1½	1	7/16	88 00

Insulators with eyes at right angles furnished to order.

Wood Strain Insulators

Continued

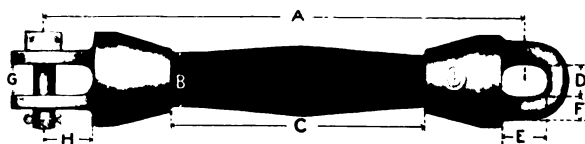
With Long Eyes



Code Word	No.	Voltage	Dimensions in Inches						List per 100
			A	B	C	D	E	F	
<i>Bobolink.</i>	9974	750	9 $\frac{7}{8}$	1	5	$\frac{5}{8}$	1 $\frac{1}{8}$	1 $\frac{3}{4}$	\$33 00
<i>Borneol.</i>	10472	750	11 $\frac{1}{8}$	1 $\frac{1}{4}$	5	$\frac{3}{4}$	1	2 $\frac{1}{4}$	44 00

Insulators with eyes at right angles furnished to order.

With Eye and Clevis



Clevis bolt is $\frac{7}{16} \times 1\frac{5}{8}$ inches.

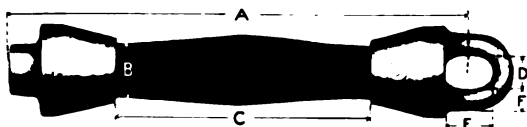
Code Word	No.	Voltage	Dimensions in Inches								List per 100
			A	B	C	D	E	F	G	H	
<i>Bodkin.</i>	9238	750	9 $\frac{1}{2}$	1	5	1 $\frac{1}{8}$	1 $\frac{5}{8}$	$\frac{7}{8}$	$\frac{5}{8}$	1	\$37 40
<i>Bollard.</i>	10295	750	10	1 $\frac{1}{4}$	5	1 $\frac{3}{8}$	1	$\frac{7}{8}$	$\frac{3}{4}$	1	48 40
<i>Bondage.</i>	10297	1500	16 $\frac{1}{2}$	1	12	1 $\frac{1}{8}$	1 $\frac{5}{8}$	$\frac{7}{8}$	$\frac{3}{4}$	1	57 20
<i>Bonfire.</i>	10298	1500	17	1 $\frac{1}{4}$	12	1 $\frac{3}{8}$	1	$\frac{7}{8}$	$\frac{3}{4}$	1	66 00

Insulators with eye and clevis in same plane or with two clevises furnished to order.
See general description on preceding page.

Wood Strain Insulators

Continued

With Eye and Tapped Boss



Threaded end casting is tapped $\frac{1}{8}$ inch, 11 threads per inch.

Code Word	No.	Voltage	Dimensions in Inches						List per 100
			A	B	C	D	E	F	
<i>Bolster.</i>	8575	750	9	1	5	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{7}{16}$	\$39 60
<i>Bombard.</i>	10296	750	$9\frac{3}{4}$	$1\frac{1}{4}$	5	$\frac{11}{16}$	1	$\frac{7}{16}$	48 40
<i>Boniform.</i>	10299	1500	$16\frac{1}{4}$	1	12	$\frac{11}{16}$	$\frac{11}{16}$	$\frac{7}{16}$	52 80
<i>Bootless.</i>	10300	1500	$16\frac{1}{4}$	$1\frac{1}{4}$	12	$\frac{11}{16}$	1	$\frac{7}{16}$	66 00

Insulators with two tapped bosses furnished to order.

See description on page 223.

Porcelain Strain Insulators



Nos. 11927-11931



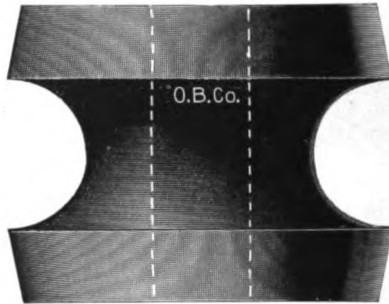
Nos. 10341-10343

Code Word	No.	Approx. Ultimate Strength in pounds	Diameter Inches	Length Inches	Diameter Grooves Inches	Approx. Weight per 100 in lbs.	List per 100
<i>Monarcho.</i>	11927	10,000	$2\frac{5}{16}$	$2\frac{5}{16}$	$\frac{3}{4}$	63	\$ 6 60
<i>Monastic.</i>	11928	12,000	$2\frac{3}{8}$	$3\frac{1}{4}$	$\frac{3}{4}$	113	8 25
<i>Monarial.</i>	11929	15,000	$3\frac{1}{4}$	5	$\frac{3}{4}$	300	22 00
<i>Monesia.</i>	11930	30,000	$4\frac{1}{4}$	$6\frac{1}{4}$	$\frac{3}{4}$	485	76 00
<i>Monetize.</i>	11931	45,000	$6\frac{1}{4}$	$8\frac{3}{4}$	1	1375	120 35
<i>Calamus.</i>	10341	10,000	$2\frac{3}{8}$	$3\frac{1}{4}$	$\frac{3}{4}$	90	13 80
<i>Calcify.</i>	10342	12,000	$2\frac{3}{8}$	$3\frac{1}{4}$	$\frac{3}{4}$	125	17 25
<i>Calcine.</i>	10343	15,000	$3\frac{1}{4}$	$5\frac{1}{4}$	$\frac{3}{4}$	290	33 35

For high voltage Porcelain Strain Insulators, see Insulator section.

Dirigo Insulating Spool

750 Volts



Code Word	No.	Height Inches	Diameter Inches	Diameter of Groove, Inches	Diameter of Hole, Inches	List per 100
<i>Bramble.</i>	4201	1½	2	¾	1½	\$17 60
<i>Bravely.</i>	4202	2	2½	1	2½	26 40

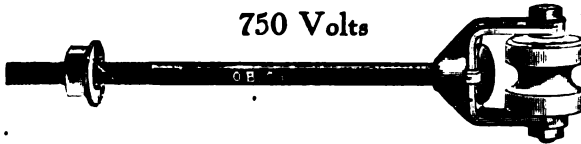
Uninsulated Eyebolt



Code Word	No.	Dimensions Inches	Finish	Diameter Eye	Length Threading	List per 100
<i>Moneyed.</i>	11932	$\frac{1}{2}$ x 5	Plain	$\frac{5}{8}$ inch	$3\frac{1}{2}$ inch	\$12 10
<i>Monger.</i>	11933	$\frac{1}{2}$ x 5	Sherardized	$\frac{5}{8}$ " "	$3\frac{1}{2}$ "	13 20
<i>Breach.</i>	1177	$\frac{1}{2}$ x 12	Plain	1 " "	6 " "	15 40
<i>Breath.e.</i>	2549	$\frac{1}{2}$ x 12	Sherardized	1 " "	6 " "	17 60
<i>Breeze.</i>	1178	$\frac{1}{2}$ x 12	Plain	1 " "	6 " "	19 35
<i>Brevet.</i>	2550	$\frac{1}{2}$ x 12	Sherardized	1 " "	6 " "	22 35
<i>Bribery.</i>	7551	$\frac{1}{2}$ x 14	Plain	1 " "	6 " "	20 35
<i>Bridal.</i>	7552	$\frac{1}{2}$ x 14	Sherardized	1 " "	6 " "	23 75
<i>Mongrel.</i>	11608	$\frac{1}{2}$ x 16	Plain	1 " "	6 " "	20 90
<i>Monisher.</i>	11609	$\frac{1}{2}$ x 16	Sherardized	1 " "	6 " "	25 30
<i>Monitive.</i>	11610	$\frac{1}{2}$ x 18	Plain	1 " "	6 " "	22 00
<i>Monitory.</i>	11611	$\frac{1}{2}$ x 18	Sherardized	1 " "	6 " "	27 50

Insulated Eyebolt

750 Volts



Threaded 6 inches.

Code Word	No.		List per 100
<i>Brigand.</i>	2555—	Eyebolt, Sherardized, $\frac{1}{8}$ x 12 inches,	No. 4201... \$61 60
<i>Brimless.</i>	2557—	" " " " " " " " " " " " " " " " " "	No. 4201.. 68 20

Uninsulated Turnbuckle

With Two Eyes



OPENINGS in eyes of $\frac{1}{2}$ and $\frac{3}{8}$ -inch bolts are 1 inch in diameter and $1\frac{1}{4}$ inches in $\frac{3}{4}$ -inch bolt.

Code Word	No.	List per 100
<i>Bristle.</i>	2561—Turnbuckle, 9-inch opening, $\frac{3}{8}$ -inch Eyebolts, Sherardized...	\$105 60
<i>Broach.</i>	7554—“ 12 “ “ “ “ “ “ “	116 60
<i>Brocade.</i>	7556—“ 12 “ “ “ “ “ “ “	138 60

Uninsulated Turnbuckle

With Eye and Hook



Opening in eye is 1 inch in diameter.

Code Word	No.	List per 100
<i>Brocket.</i>	2563—Turnbuckle, 9-inch opening, $\frac{3}{8}$ -inch Eyebolts, Sherardized...	\$101 20
<i>Broiler.</i>	7558—“ 12 “ “ “ “ “ “ “	112 20

Insulated Turnbuckle

With Insulated Eye—750 Volts



ONE of the eyes of the Turnbuckle is insulated from the body by a heavy covering of Dirigo Insulation. Opening in uninsulated eye is 1 inch and in insulated eye $\frac{9}{16}$ inch in diameter.

Code Word	No.	List per 100
<i>Broiling.</i>	4206—Turnbuckle, 6-inch opening, $\frac{1}{2}$ -inch Eyebolts, Sherardized...	\$149 60

Insulated Turnbuckle

With Brooklyn—750 Volts



MADE up of the Uninsulated Turnbuckle No. 2561, and the Single Brooklyn Strain Insulator No. 9995. Openings in eyes are 1 inch.

Code Word	No.	List per 100
<i>Broking.</i>	4198—Turnbuckle, 9-inch opening, $\frac{1}{2}$ -inch Eye Bolt, Sherardized.	\$204 60

Insulated Turnbuckle

With Dirigo Spools No. 4201—750 Volts



Code Word	No.	List per 100
<i>Broncho.</i>	2570—Turnbuckle, 9-inch opening, $\frac{1}{2}$ -inch Forked Bolts, Sher.	\$163 90
<i>Brooch.</i>	7562— " 12 " " $\frac{1}{2}$ " " " " " " " " " " " "	173 30

Insulated Turnbuckle

With Porcelain Spools No. 7548—750 Volts



Code Word	No.	List per 100
<i>Brother.</i>	2566—Turnbuckle, 9-inch opening, $\frac{1}{2}$ -inch Forked Bolts, Sher.	\$123 20
<i>Browed.</i>	7564— " 12 " " $\frac{1}{2}$ " " " " " " " " " " " "	138 60

Clevis Attachment

For Frogs, Cross-Overs, Section Insulators, etc.



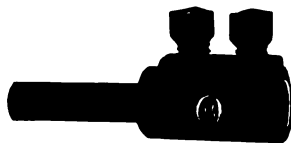
ONE end of this Clevis Attachment is intended to be attached directly to the pull-off eyes of Frogs, Cross-Overs, Section Insulators, etc., and the other end to the span wire by means of bolts and cotter pins.

The advantage of its use lies in the fact that this arrangement makes it unnecessary to make up a new splice in the span wire every time the Frog or Cross-Over is replaced.

The openings in both clevises are $\frac{9}{16}$ inch, and the bolts are $\frac{7}{16}$ inch in diameter. It can be used with 1 and $1\frac{1}{4}$ -inch O-B Wood Strain Insulators, and with all sizes of O-B Composition Strain Insulators.

Code Word	No.	List per 100
<i>Inusitate.</i>	11104—Clevis Attachment, Malleable Iron, Sherardized.....	\$33 00

Feeder Wire Adaptor



USED for attaching 4-0 feeder wires to Feeder Ears, Feeder Clamps and Section Insulators that are fitted with feeder lugs for 2-0 feeder wire.

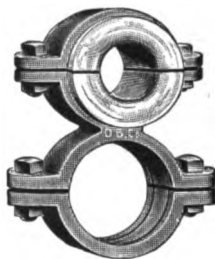
It is made from a one-piece bronze casting and 4-0 solid or stranded feeder wire is held in the Adaptor by means of two set screws.

The Adaptor projects a distance of $1\frac{3}{8}$ inch out of the feeder lug on the device with which it is used.

Code Word	No.	List per 100
<i>Herald.</i>	10488—Feeder Adaptor, 4-0 to 2-0, Bronze.....	\$35 20

Feed-In Insulator

For Pole Brackets



FOR use on pole bracket construction to support and insulate the tap wire running from the feeder to the trolley wire. The insulation is porcelain with an opening 1 inch in diameter.

Code Word	No.	List per 100
<i>Compart.</i>	4462—Insulator, for 1½-inch Pipe (1½-inch outside diameter).....	\$48 40
<i>Compass.</i>	4463—“ “ 2 “ “ (2½ “ “ “).....	50 60

Wooden Tree Insulator



MADE in halves of seasoned hard wood, hollowed out in the center to fit over the wire, and saturated with an insulating compound.

Code Word	No.	List per 100
<i>Compile.</i>	2600—Tree Insulator, 12 inches long, ½-inch hole.....	\$35 20
<i>Complice.</i>	2601—“ “ 18 “ “ ¾ “ “	39 60
<i>Complot.</i>	2603—“ “ 18 “ “ ¾ “ “	39 60
<i>Compone.</i>	2605—“ “ 18 “ “ ¾ “ “	39 60
<i>Comport.</i>	2607—“ “ 18 “ “ 1 “ “	39 60
<i>Composer.</i>	2609—“ “ 18 “ “ 1½ “ “	46 20

Feeder Wire Insulators

Dirigo Insulation—750 Volts



No. 8648



Nos. 8646 and 8297



No. 7627

CATALOGUE No. 8648, Side Bearing Insulator, Form 1, is adapted for use on corner construction, as the feeder wire is supported at the side of the Insulator, close to the cross arm, thus placing the strain on the insulator pin to the best advantage.

It consists of a malleable iron shell into which is moulded Dirigo Insulation. Size of pin hole is one inch.

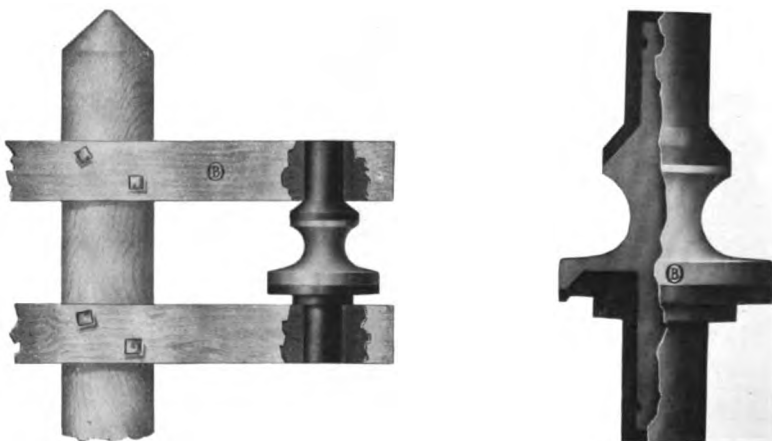
The Nos. 8646 and 8297 Top and Side Bearing Insulators, Form 1, are similar to the Side Bearing Insulator described above with the addition of a receptacle on the top. The upright prongs, being of malleable iron, may be bent down over the feeder wire to secure it in place. Size of pin hole is 1 inch.

The No. 7627 Top and Side Bearing Insulator, Form 2, is made entirely of Dirigo Insulation, and is suitable for both straight line and corner suspension, the top groove being used for the former and the side groove for the latter.

Code Word	No.	List per 100
<i>Bracteal.</i>	8648—Side Bearing Insulator, Form 1, Sherardized, for Wire 1½ inches in diameter or less.....	\$57 20
<i>Bragger.</i>	8646—Top and Side Bearing Insulator, Form 1, Sherardized, for Wire 1 to 1½ inches in diameter.....	63 80
<i>Braiding.</i>	8297—Top and Side Bearing Insulator, Form 1, Sherardized, for Wire 1½ to 1¾ inches in diameter.....	90 20
<i>Brained.</i>	7627—Top and Side Bearing Insulator, Form 2, for Wire 1¾ inches in diameter or less.....	79 20

Grover Corner Feeder Wire Insulator

750 Volts



USED for supporting and insulating heavy feeder cables when sharp angle bends are made. Made of a sherardized malleable iron casting with a heavy coating of Dirigo Insulation over each end and under the flange.

Installed between two horizontal cross-arms bored with $1\frac{1}{2}$ inch holes to receive ends of the insulator. Distance between cross-arms should be $3\frac{1}{4}$ inches.

Can be used with cables $1\frac{1}{4}$ inch in diameter or smaller.

Height overall, $7\frac{1}{8}$ inches; diameter flange, $3\frac{3}{4}$ inches.

Code Word

No.

List per 100

Brainy.

4327—Insulator, Sherardized, diameter of groove $1\frac{1}{8}$ inches. \$145 20

Security Mine Feeder Wire Insulator

Form 1—Patented



No. 3207



No. 3210



No. 3208



No. 3209

INTENDED for supporting and insulating feeder wires in mines and consists of three parts, viz.: semi-porcelain Insulator, malleable iron Pin and Locking Washer.

One end of Pin is pointed, fluted and barbed to make it easy to drive into wall or roof of mine, and to secure a firm anchorage when in place. Opposite end is formed to facilitate placing Insulator on easily and quickly and then securely holding it there.

Grooves are provided through Insulator to drain off any moisture which may accumulate and run down Pin.

Length overall is 8 $\frac{1}{2}$ inches. Insulator spool is 2 $\frac{1}{2}$ inches high, 2 $\frac{1}{2}$ inches in diameter and has a $\frac{1}{4}$ -inch groove.

Code Word	No.	List per 100
<i>Brouse.</i>	3207—Insulator complete.....	\$13 80
<i>Bruise.</i>	3208—Semi-Porcelain Insulator.....	5 10
<i>Brussels.</i>	3209—Malleable Iron Pin, plain finish.....	7 95
<i>Brutal.</i>	3210— “ “ Washer, plain finish.....	90

Security Mine Feeder Wire Insulator

Form 2—Patented



SIMILAR to the Form 1, except that it is constructed so the insulation cannot turn or back off when in use.

Provided with a spring, which is strongly recommended when Insulator is to be used in a horizontal position. It is not necessary to use a spring when Insulator is placed in roof of mine or in a vertical position, as insulator spool would then be in a position to lock itself upon pin.

Length overall is $8\frac{1}{2}$ inches. Insulator spool is $2\frac{1}{2}$ inches high, $2\frac{1}{2}$ inches in diameter and has a $\frac{3}{4}$ -inch groove.

Code Word	No.	List per 100
<i>Bubble.</i>	8737—Insulator complete with Sherardized Spring.....	\$14 95
<i>Buckram.</i>	8738—“ without Spring.....	13 00
<i>Budding.</i>	8739—Semi-Porcelain Insulator only.....	5 10
<i>Buffet.</i>	8740—Spring only, Sherardized.....	2 45
<i>Brussels.</i>	3209—Malleable Iron Pin only, plain finish.....	7 95

Security Mine Feeder Wire Insulator

Form 3



No. 11002



No. 11004

USED for supporting and insulating feeder wires in mines and is similar to the Forms 1 and 2, except that barbed pin is threaded at lower end and screws into porcelain spool.

Installation is simple, it being only necessary to drive barbed pin into roof or wall and then screw spool onto pin.

Porcelain insulator is recessed on top and lower part of pin is hollow for draining off moisture which runs down from mine roof and preventing it from collecting on feeder wire.

Height overall is 9 inches. Porcelain spool is $2\frac{3}{4}$ inches high, $2\frac{3}{4}$ inches in diameter, and has a $\frac{3}{4}$ -inch groove.

Code Word	No.	List per 100
<i>Inoculate.</i>	11002—Insulator complete.....	\$38 30
<i>Inoculator.</i>	11003—Porcelain Insulator, only.....	14 50
<i>Inodiate.</i>	11004—Malleable Iron Pin, plain finish	23 90

Standard Mine Feeder Wire Insulator

Form 1, with Porcelain Insulator



No. 10630



No. 10632

USED for supporting and insulating feeder wire in mines and consists of a high grade porcelain spool and a malleable iron pin made in two halves. One half of the pin is barbed and the other half is plain. In installing, the barbed half is first inserted in a hole in the mine roof, which should be drilled slightly smaller than the diameter of the pin, and the plain half of the pin is then driven into the hole, forcing the barbs into the side of the hole and securing the pin firmly in place. The pin is interchangeable in the Form 1 and Form 2 Insulators.

The porcelain insulator is recessed on the top and the pin is hollow in the center and has an opening for draining off moisture which runs down from the roof of the mine, thus preventing it from collecting on the feeder wire.

Height overall is $8\frac{3}{4}$ inches. The insulator spool is $3\frac{5}{8}$ inches high, 3 inches in diameter and has a 1 inch groove.

Code Word	No.	List per 100
<i>Heretic.</i>	10630—Insulator complete	\$29 70
<i>Herodian.</i>	10631—Porcelain Insulator only.....	12 80
<i>Heroic.</i>	10632—Malleable Iron Pin, plain finish.....	16 90

Standard Mine Feeder Wire Insulator

Form 2, with Glass Insulator



USED for supporting and insulating feeder wire in mines and is similar to the Form 1 Insulator listed on the preceding page with the exception that the insulating spool is made of glass.

The malleable iron pin is threaded on one end to receive the insulator, which is made of glass, and pointed and barbed on the other to fasten it in position by driving into the roof of the mine. The glass insulator is recessed on the end and the pin is hollowed in the center, with an opening provided from the outside, for the purpose of preventing moisture from running down the latter from the roof of the mine and collecting on the feeder wire. Height overall is $8\frac{1}{2}$ inches. The insulator spool is $3\frac{1}{8}$ inches high, $2\frac{3}{4}$ inches in diameter and has a $\frac{1}{4}$ -inch groove.

Code Word	No.	List per 100
<i>Bullet.</i>	2622—Insulator complete.....	\$31 90
<i>Bulwark.</i>	2096—Glass Insulator only	16 10
<i>Heroic.</i>	10632—Malleable Iron Pin, plain finish.....	16 90

Type C Mine Feeder Wire Insulator

For Heavy Cable



USED for supporting and insulating large feeder cables in mines where the cable is to be suspended from the mine roof. It is made in two sizes, one for 300,000 C. M. and smaller, weatherproof cable, and the other for 1,000,000 C. M. and smaller.

It consists of a high grade porcelain spool insulator, a clevis made from heavy bar iron and our regular Form 1 Expansion Bolt, by means of which the insulator may be attached directly to the mine roof.

Both sizes of this Insulator afford a very secure support and ample insulation for heavy feeder cables and proper clearance is provided by the yoke of the clevis.

In No. 10626 the porcelain spool is $2\frac{1}{4}$ inches in height, $2\frac{1}{8}$ inches in diameter and has a 1-inch groove, while the spool in No. 10627 is 3 inches in height, $4\frac{1}{8}$ inches in diameter and has a $1\frac{1}{4}$ -inch groove.

Distance from top of clevis to lower edge of spool is $4\frac{1}{4}$ inches in No. 10626 and $6\frac{1}{4}$ inches in No. 10627, while Expansion Bolt in both cases is 6 inches long.

Code Word
Heroine.
Heroism.

No.	List per 100
10626—Insulator for 300,000 C. M. weatherproof cable and smaller..	\$66 00
10627—Insulator for 1,000,000 C. M. weatherproof cable and smaller.	94 60

Porcelain Insulating Knobs



No. 10459



No. 10460



Nos. 1169-7548



No. 4200



No. 2545

Code Word	No.	Std. No.	Height Inches	Diam. Inches	Diam. Hole Inches	Diam. Groove Inches	Approx. Weight packed per 1000, in lbs.	No. in Standard Package	List per 1000
<i>Cabaret.</i>	10459	5½	1 7/8	1	1/8	1/8	80	5000	\$15 80
<i>Cabbage.</i>	10460	4½	1 7/8	1 1/4	1/8	1/8	250	2000	26 70
<i>Cabinet.</i>	1169	24	1 3/4	2	1/8	1/8	400	1000	65 40
<i>Caboose.</i>	7548	*24	1 3/4	2	1/8	1/8	400	1000	65 40
<i>Cackle.</i>	4200	1	3 1/4	2 1/4	1/8	1/8	800	650	116 20
<i>Caddish.</i>	2545	† 0	2 1/4	3	1/8	1	1100	350	193 60

*Similar to Standard No. 24 except 1/8-inch hole instead of 1/16-inch.

†Similar to Standard No. 0 except 1/8-inch hole instead of 1 1/4-inches.

Glass Insulators



No. 2614



No. 2615



No. 4430



No. 7628

Code Word	No.	Description	For Size Wire	Approx. Weight packed per 1000	No. in Standard Package	List per 1000
<i>Buoyancy.</i>	2614	Pony, Double Petticoat, Deep Groove	No. 4 B. & S. Telephone " " "	950 lbs.	275	\$ 56 00
<i>Burden.</i>	2615	Standard Pony		750 "	350	47 60
<i>Burdock.</i>	4430	Pony, D'ble Groove		760 "	340	47 60
<i>Bureau.</i>	7628	Transposition, D'ble Petticoat		1700 "	125	110 70

Glass Insulators



Nos. 1231—4328



No. 1233



No. 1232

Code Word	No.	Description	For Size Wire	Approx. Weight packed per 1000	No. in Standard Package	List per 1000
<i>Burglar.</i>	1233	Double Petticoat, Deep Groove.	No. 0 B. & S. " 4-0 " " 1 1/2" & smaller " 2"	1475 lbs.	175	\$ 85 40
<i>Burgonet.</i>	1232	Double Petticoat, Extra Large G've		1450 "	165	85 40
<i>Burrower.</i>	1231	Top Groove		2100 "	110	116 50
<i>Bushment.</i>	4328	" "		2100 "	110	116 50

Insulated Arc Lamp Hangers

11,000 Volts



PROVIDES a secure mechanical suspension and reliable insulation for arc lamps.

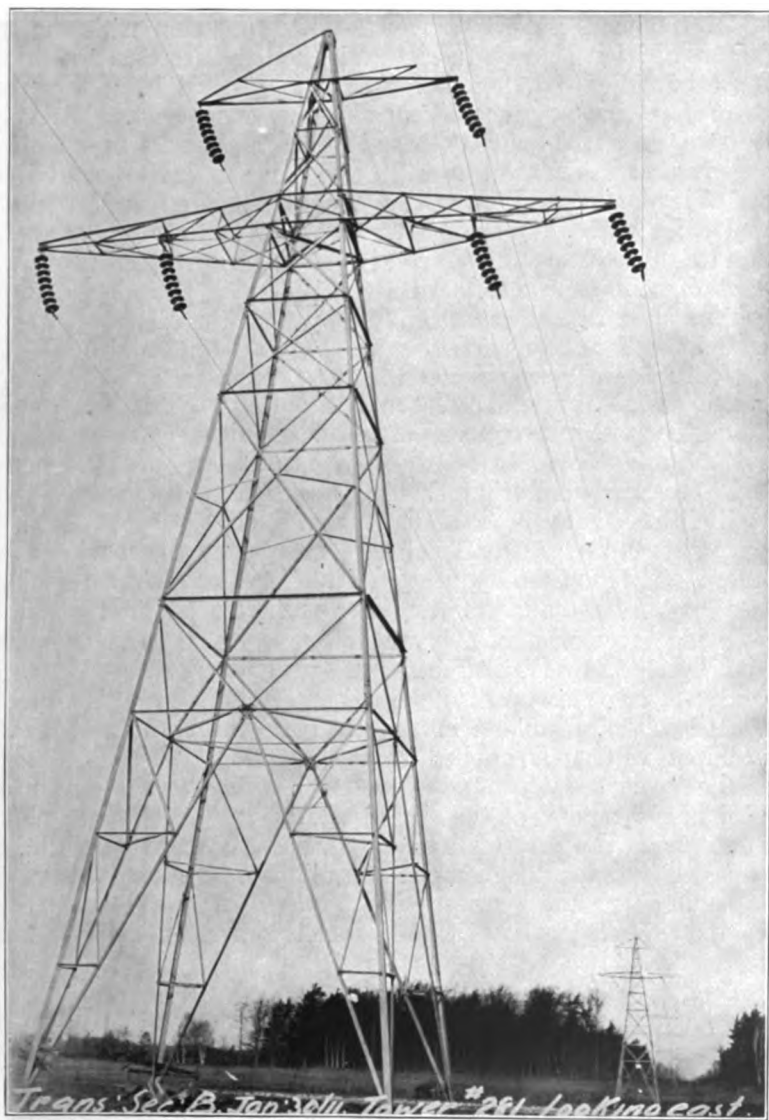
High grade porcelain insulating member is equipped with malleable iron cap and hook cemented in place. The parts are interlocked so that, even should the cement fail, it is impossible for the lamp to fall.

Wood stick is made of hickory and is impregnated with an insulating compound. The ends are threaded with standard 1-inch insulator threading. Porcelain or glass insulators can be furnished to order.

Diameter porcelain, 5 inches. Diameter hole in cap, $\frac{3}{16}$ inch. Opening in hook, $\frac{1}{8}$ inch. Length spreader arm without insulators, $15\frac{5}{16}$ inches.

Code Word	No.	List per 100
Monarch.	11642—Arc Lamp Hanger	\$176 00

O-B Hi-Tension Insulators in Service



TRANSMISSION Line of Hydro-Electric Power Commission of Ontario,
110,000 volts. O-B Suspension Type Insulators on a curve.

O-B Hi-Tension Porcelain Insulators

Testing Insulators

ONE of the most important features in connection with the manufacture of High Tension Insulators is the final electrical test to which they must be submitted, together with a most rigid inspection for the purpose of detecting any mechanical flaw that may exist. The voltages that are safely possible for the transmission of power are now limited by the pressure that the Insulators will bear, and the development is along the lines of higher carrying capacities. As transformers can be built that are reliable for twice the voltage that any line so far constructed will carry, and as the distance, over which power can be transmitted with a fixed cost of conductor, varies with the potential, the length of transmission lines is to a great extent limited by the insulator.

Our facilities for testing are adequate and accurate and our constant aim is to furnish an Insulator that will not fail in service.

In testing High Tension Insulators it is our aim to duplicate, as nearly as possible, the most severe electrical and mechanical strains to which the insulator may be liable in actual service, and our laboratory is well equipped to make fog, precipitation and other tests to accurately determine the limitations and possibilities of our products.

Severe "standard" commercial tests are given each insulator before shipment, consisting of the application of the test voltages, given in this catalogue, to the complete insulator for two minutes, together with a "part test" in which each part of every insulator is tested before assembling. When not specified by the Purchaser the voltage to be used on the part test is adjusted to approximate the electrical strain to which each part is subjected when assembled in the complete insulator, and when the Standard test voltage is applied to the assembled insulator. By this method the "part test" voltage is varied according to the design of the assembled insulator, and at the same time this method insures that each part will provide the protection required, or in other words, will do its share towards helping the complete insulator to withstand the conditions imposed in regular service. Any insulator that does not fulfill all the requirements of the specifications under which it is made is immediately rejected.

Ratings

WHEN requesting recommendations for Insulator service, give accurate information regarding maximum working voltage, climatic conditions and geographic location, as an insulator that might be entirely suitable for one locality might be entirely unsuitable for another locality to carry the same voltage, as fogs, excessive rain storms, sea coast and other conditions influence largely the type and size of a High Tension Insulator.

O-B Hi-Tension Porcelain Insulators

Continued

Commercial Insulator Tests

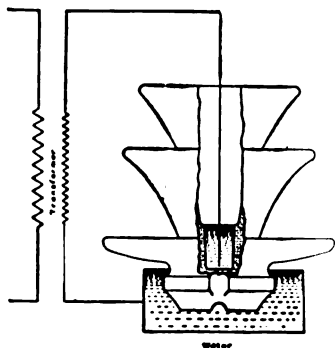


Figure 1

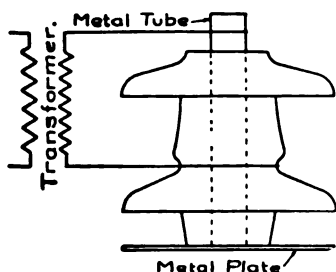


Figure 2

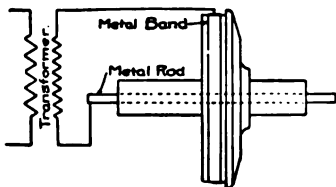


Figure 3

THE standard duration of our tests is two minutes at the full test voltage. The method of testing all Insulators of the standard petticoat type is illustrated in Fig. 1. The assembled Insulator is inverted and immersed in water up to the middle of the tie wire groove, the pinhole filled with water and the potential is then applied.

Each separate piece of all multi-part Insulators is tested in this way before assembling. The voltage applied in these tests is determined, as stated above, except in cases where arcing would occur at this point. In such instances the part is tested to within 5,000 volts of the arcing voltage. After the parts have been tested, the Insulator is assembled and tested again.

Strain Insulators are tested after the manner shown in Fig. 2. Attention is called to the fact that this test is arranged to closely approximate actual working conditions.

All Wall Insulators, Floor Tubes, Bushings and similar pieces, are tested after the method shown in Fig. 3.

Our testing apparatus which is of the newest design is at the disposal of engineers. We are prepared to make reliable tests over 400,000 volts under various conditions of precipitation, fog, etc., and will be pleased to have engineers make their own tests or to witness any special tests which they may specify at our factory.

Our testing transformer is never overloaded as our testing racks are so proportioned that they will not hold insulators in sufficient quantities to overload the transformer and affect its regulation.

Leakage Distance

THE Leakage Distance, as given in the list for each Insulator on the following pages, is obtained by measuring the Insulator or drawing as indicated by the line D-E shown in Fig. 2 on page 246.

O-B Hi-Tension Porcelain Insulators

Continued

Sparking Distances of Insulators

THE voltage value necessary to cause an Insulator to arc from the tie wire to the pin can be closely approximated by measuring the Insulator or a drawing as indicated in Figs. 1 or 2 and referring to the accompanying table. Actual tests will give slightly different results according to conditions, but by following out this scheme fairly conservative estimates may be made upon the arcing voltage.

In Fig. 1 the sum of distances (A or D) + B + C gives the dry arcing distance, A or D being used depending upon which gives the shortest distance between the conductor and the lower edge of the top shell. In Fig. 2 the sum of A + B + C gives the arcing distance wet with the precipitation at 45 degrees with the vertical.

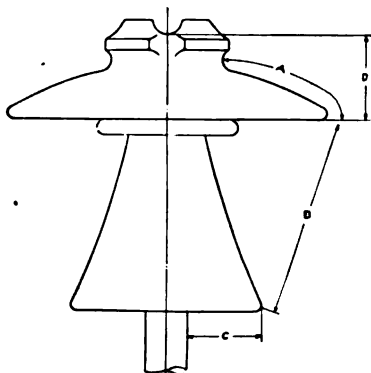


Figure 1

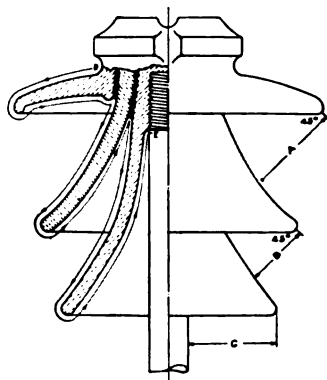


Figure 2

The following table indicates the sparking distances, in effective volts, between sharp needle points in air, adopted as standard by the A. I. E. E.

Kilovolts	Inches	Kilovolts	Inches	Kilovolts	Inches
5	0.225	50	3.55	140	13.95
10	0.47	60	4.65	150	15.00
15	0.725	70	5.85	170	17.80
20	1.00	80	7.10	200	20.50
25	1.30	90	8.35	250	25.60
30	1.625	100	9.60	300	31.00
35	2.00	110	10.75	350	36.10
40	2.45	120	11.85	400	41.20
45	2.95	130	12.95	...	...

A spark gap with needle points whose distance apart is accurately adjustable is kept on the high voltage leads of our testing set as a continual check on the accuracy of the measurements as made with the volt-meter on the primary circuit.

O-B Hi-Tension Porcelain Insulators

Continued

Standard Insulator Threads

THE standard threading for both pins and pin holes is four threads per inch.

Standard diameters are 1 inch for standard pin hole and $1\frac{1}{8}$ inches for large pin hole. These dimensions are the extreme diameters at top of pin and at small end of pin hole.

Standard taper for pins and pin holes is $\frac{1}{16}$ -inch increase in diameter per inch of length.

Cementing

ALL High Tension Insulators, consisting of two or more parts, are assembled and carefully packed before leaving the factory. The larger sizes may be shipped unassembled when so specified by the customer, in which case the customer is to do the assembling at his own expense. Nothing but the very best Portland cement is used, and care is taken that a perfect set and correct alignment are secured.

Glazes

THE color of an Insulator is a matter of taste. Brown glaze has been almost universally adopted as standard, because of the fact that it is less conspicuous than other colors.

We can furnish a slate colored glaze when desired but in all cases we will furnish brown glaze unless otherwise specified.

In burning a kiln full of insulator parts, it is impossible to have them all come through with exactly the same shade of glaze, and we wish to call attention to the fact that in assembling the multi-part insulators we endeavor to assemble parts having the same shade of glaze. This adds materially to the appearance of the line.

Drawings and Samples

UPON request, Managers and Engineers will be furnished detailed drawings and samples. The weight given will not vary more than 5 to 10 per cent., depending on the size of the insulator.

O-B Porcelain Insulator

Pony—Double Groove



No. 9400

Diameter of Insulator.	2 $\frac{1}{4}$ in.
Height of Insulator.	2 $\frac{1}{4}$ "
Diameter of wire groove	$\frac{3}{8}$ "
Size of pin hole.	1 "
Approximate Net Weight, per 100, in lbs.	56
Approximate Weight packed, per 100, in lbs.	61
Approximate Number in barrel.	600

Code Word
Buskin.

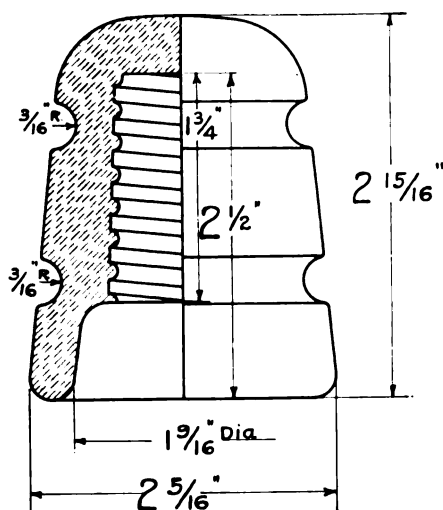
No.
9400—Double Groove Insulator for Telephone Wire.

List per 1000

\$35 50

O-B Porcelain Insulator

Pony—Double Groove



No. 9400

See description and list on the opposite page.

O-B Porcelain Insulator

Pony—Large Size



No. 10565

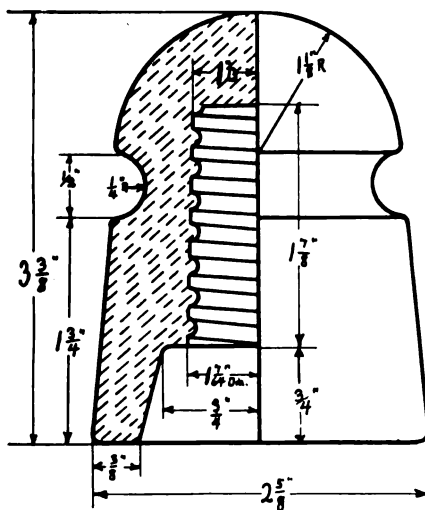
Diameter of Insulator.....	2 $\frac{1}{2}$ in.
Height of Insulator.....	3 $\frac{3}{8}$ "
Diameter of wire groove.....	$\frac{1}{2}$ "
Size of pin hole.....	1 "
Approximate Net Weight, per 100, in lbs.....	78
Approximate Weight packed, per 100, in lbs.....	88
Approximate Number in barrel.....	450

Code Word
Pondling.

No. List per 1000
10565—Large Size Insulator for Telephone Wire.....\$52 80

O-B Porcelain Insulator

Pony—Large Size



No. 10565

See description and list on the opposite page.

O-B Porcelain Insulator

Transposition



No. 10747

Diameter of Insulator.....	3 $\frac{3}{4}$ inches
Height of Insulator.....	4 "
Diameter of Wire Groove.....	$\frac{3}{8}$ "
Size of Pin Hole.....	1 "
Approximate Net Weight, per 100, in lbs.....	155
Approximate Weight Packed, per 100, in lbs.....	176
Approximate Number in barrel.....	200

Code Word

Heroner.

No.

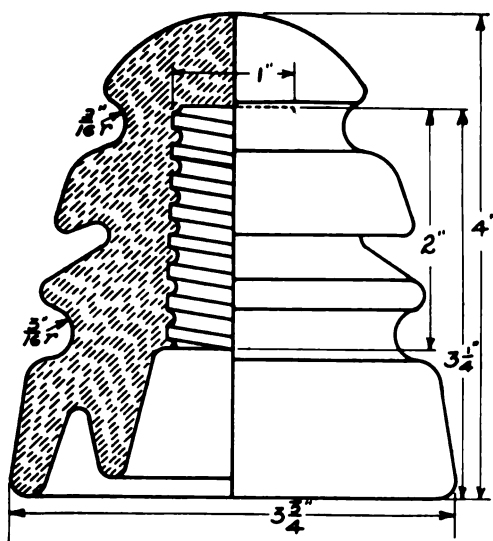
10747—Transposition Insulator for Telephone Wires.....

List per 1000

\$205 00

O-B Porcelain Insulator

Transposition



No. 10747

See description and list on the opposite page.

O-B Porcelain Insulator

Deep Groove—Double Petticoat—4000 Volts



No. 10387

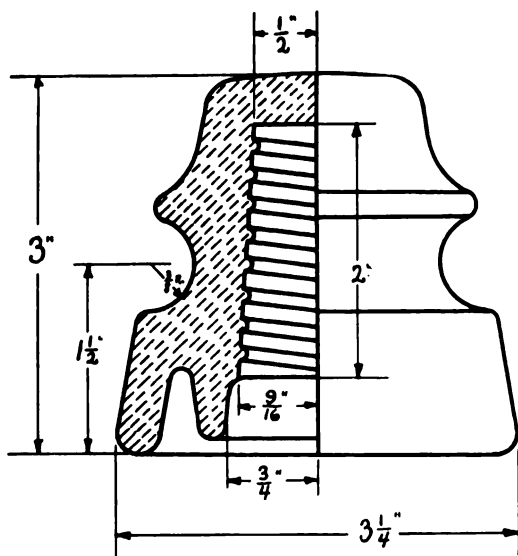
Working Voltage.....	4000
Leakage Surface	3½ in.
Arcing Distance, wet	¾ "
Diameter of Insulator	3¼ "
Height of Insulator.....	3 "
Diameter of groove.....	¾ "
Size of pin hole.....	1 "
Approximate Net Weight, per 100, in lbs.....	90
Approximate Weight packed, per 100, in lbs.....	94
Approximate Number in barrel	330

Code Word	No.	List per 1000
Butler.	10387—Insulator for 4000 Volts	\$118 75

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

Deep Groove—Double Petticoat—4,000 Volts



No. 10387

See description and list on the opposite page.

O-B Porcelain Insulator

Deep Groove—Double Petticoat

4,000 Volts



No. 9990

Working Voltage.....	4,000
Leakage Surface.....	3½ inches
Arcing Distance, wet.....	¾ "
Diameter of Insulator.....	3½ "
Height of Insulator.....	4 "
Diameter of wire groove.....	¾ "
Size of pin hole.....	1 "
Approximate Net Weight, per 100, in lbs.....	116
Approximate Weight packed, per 100, in lbs.....	132
Approximate Number in barrel.....	250

Code Word
Bustler.

No.
9990—Deep Groove, Double Petticoat Insulator.....

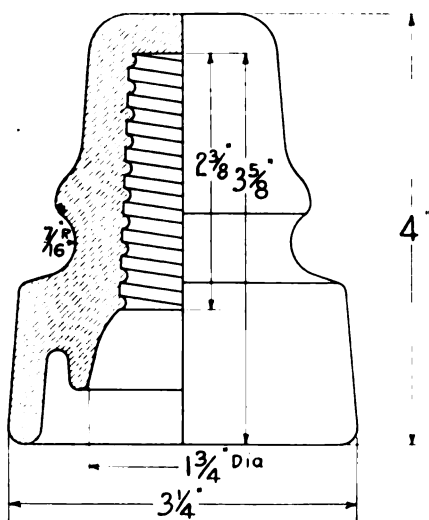
List per 1000

\$110 00

O-B Porcelain Insulator

Deep Groove—Double Petticoat

4,000 Volts



No. 9990

See description and list on the opposite page.

O-B Porcelain Insulator

Deep Groove—Double Petticoat

4,000 Volts



No. 9990

Working Voltage.....	4,000
Leakage Surface.....	3½ inches
Arcing Distance, wet.....	3 " "
Diameter of Insulator.....	3½ " "
Height of Insulator.....	4 " "
Diameter of wire groove.....	7 " "
Size of pin hole.....	1 " "
Approximate Net Weight, per 100, in lbs.....	116
Approximate Weight packed, per 100, in lbs.....	132
Approximate Number in barrel.....	250

Code Word
Bustler.

No.
9990—Deep Groove, Double Petticoat Insulator.....

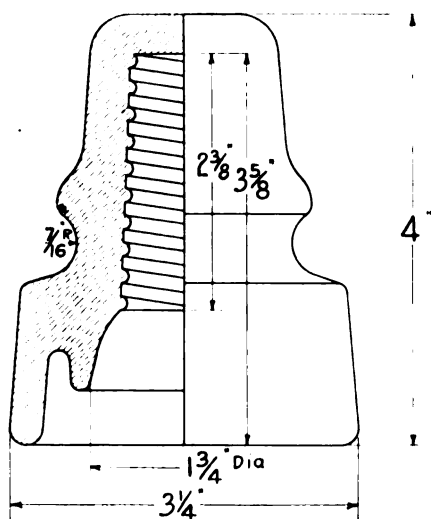
List per 1000

\$110 00

O-B Porcelain Insulator

Deep Groove—Double Petticoat

4,000 Volts



No. 9990

See description and list on the opposite page.

O-B Porcelain Insulator

6,600 Volts



No. 9403

Working Voltage	6600
Leakage Surface	5½ inches
Arcing Distance, wet	1½ "
Diameter of Insulator	3¾ "
Height of Insulator	3 "
Diameter of top groove	⅝ "
Diameter of side groove	½ "
Size of pin hole	1 "
Approximate Net Weight, per 100, in lbs	118
Approximate Weight packed, per 100, in lbs	136
Approximate Number in barrel	230

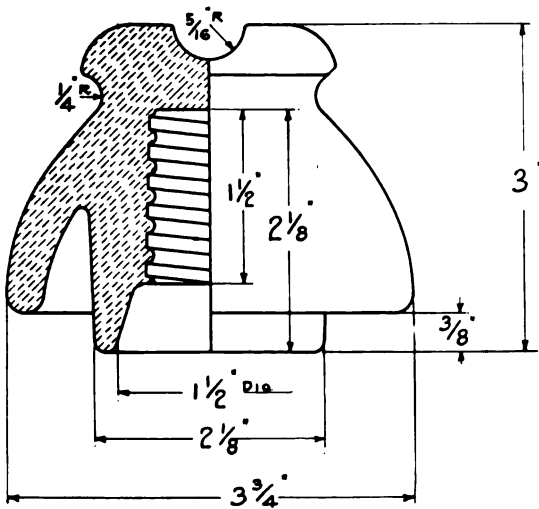
Code Word
Caliph.

No. 9403—Insulator for 6,600 Volts List per 1000 \$121 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

6,600 Volts



No. 9403

See description and list on the opposite page

O-B Porcelain Insulator

6600 Volts



No. 9404

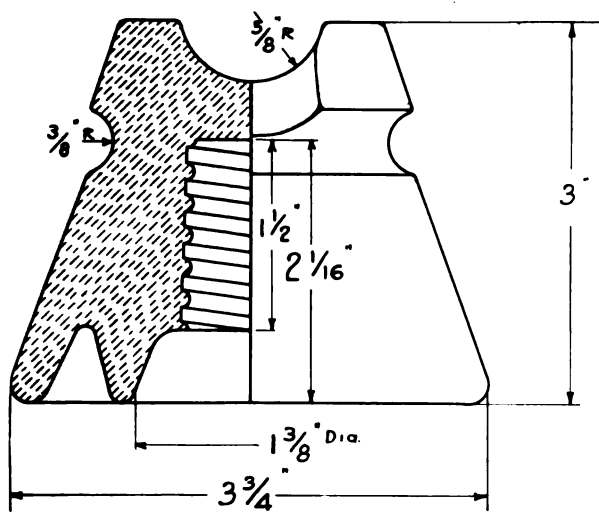
Working Voltage.	6600
Leakage Surface.	5 in.
Arcing Distance, wet.	11 1/4 "
Diameter of Insulator.	3 3/4 "
Height of Insulator.	3 "
Diameter of top groove.	1 1/4 "
Diameter of side groove.	3/4 "
Size of pin hole.	1 "
Approximate Net Weight, per 100, in lbs.	114
Approximate Weight packed, per 100, in lbs.	126
Approximate Number in barrel.	230

Code Word	No.	List per 1000
Callus.	9404—Insulator for 6600 Volts	\$121 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

6,600 Volts

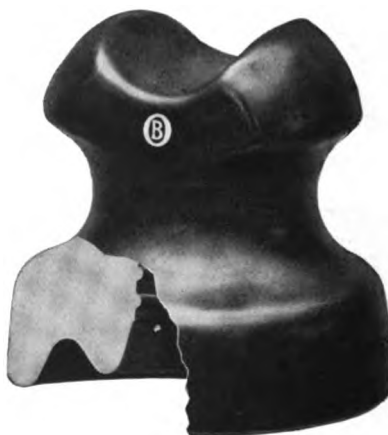


No. 9404

See description and list on the opposite page.

O-B Porcelain Insulator

6600 Volts



No. 9953

Working Voltage.....	6600
Leakage Surface.....	3 $\frac{3}{4}$ in.
Arcing Distance, wet.....	1 $\frac{1}{4}$ "
Diameter of Insulator.....	3 $\frac{1}{8}$ "
Height of Insulator.....	3 $\frac{1}{2}$ "
Diameter of top groove.....	1 $\frac{1}{2}$ "
Diameter of side groove.....	1 $\frac{1}{2}$ "
Size of pin hole.....	1 "
Approximate Net Weight, per 100, in lbs.....	147
Approximate Weight packed, per 100, in lbs.....	172
Approximate Number in barrel.....	200

Code Word
Calotype.

No.

9953—Insulator for 6600 Volts.....

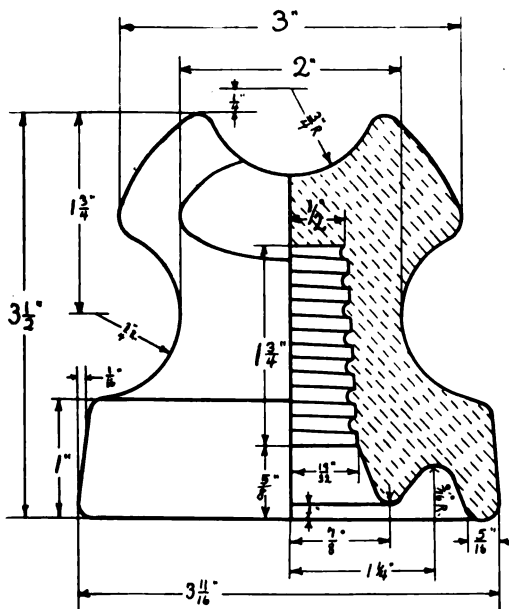
List per 1000

\$176 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

6,600 Volts



No. 9953

See description and list on the opposite page.

O-B Porcelain Insulator

6600 Volts



No. 10041

Working Voltage.	6600
Leakage Surface.	3 $\frac{1}{4}$ in.
Arcing Distance, wet.	1 $\frac{1}{4}$ "
Diameter of Insulator.	3 $\frac{3}{8}$ "
Height of Insulator.	3 $\frac{1}{8}$ "
Diameter of top groove.	1 $\frac{1}{2}$ "
Diameter of side groove.	1 $\frac{1}{2}$ "
Size of pin hole.	1 "
Approximate Net Weight, per 100, in lbs.	104
Approximate Weight packed, per 100, in lbs.	120
Approximate Number in barrel.	250

Code Word
Caloric.

No.

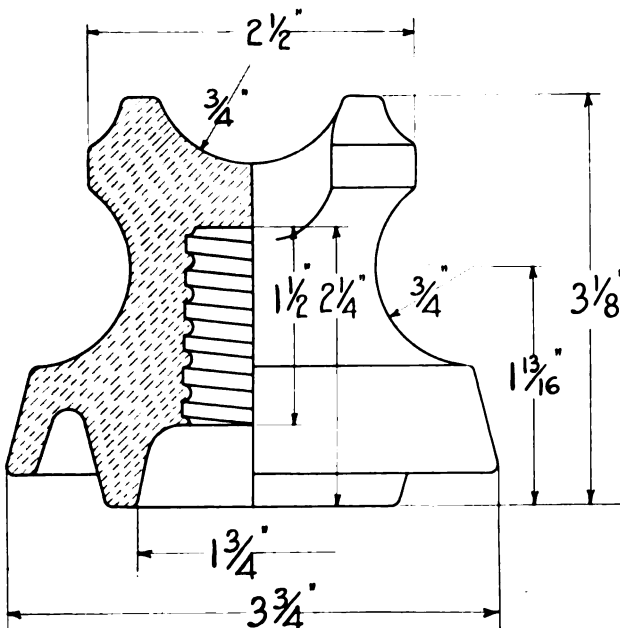
10041—Insulator for 6600 Volts \$154 00

List per 1000

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

6,600 Volts



No. 10041

See description and list on the opposite page.

O-B Porcelain Insulator

6,600 Volts



No. 10636

Working Voltage (Catenary Service)*	600-1,500
Working Voltage (Transmission Service)	6,600
Test Voltage	40,000
Leakage Surface	4 $\frac{3}{4}$ inches
Arcing Distance, wet	1 $\frac{3}{8}$ "
Diameter of Insulator	4 $\frac{1}{2}$ "
Height of Insulator	3 $\frac{7}{16}$ "
Diameter of top groove	1 "
Diameter of side groove	1 "
Size of pin hole	1 $\frac{3}{8}$ "
Use a 1 $\frac{3}{8}$ -inch pin with length above cross arm not less than 4	"
Approximate Net Weight, per 100, in lbs	178
Approximate Weight packed, per 100, in lbs	193
Approximate Number in barrel	140

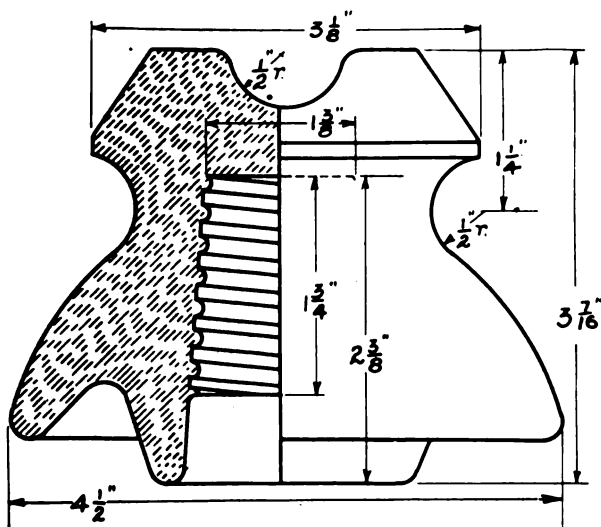
Code Word	No.	List per 1000
Herring.	10636—Insulator for 6,600 Volts	\$214 00

*Ground return circuit with full line voltage on a single Insulator.

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

6,600 Volts

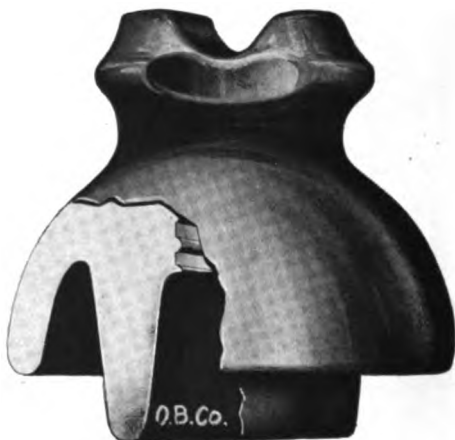


No. 10636

See description and list on the opposite page.

O-B Porcelain Insulator

11,000 Volts



No. 9406

Working Voltage.....	11,000
Test Voltage.....	40,000
Leakage Surface.....	7½ in.
Arcing Distance, wet.....	1½ "
Diameter of Insulator.....	4¾ "
Height of Insulator.....	4½ "
Diameter of top groove.....	1½ "
Diameter of side groove.....	¾ "
Size of pin hole.....	1 "
Use a 1-inch pin with length above cross arm not less than.....	4 "
Approximate Net Weight, per 100, in lbs.	167
Approximate Weight packed, per 100, in lbs.	200
Approximate Number in barrel.....	135

Code Word
Calver.

No.
9406—Insulator for 11,000 Volts.....

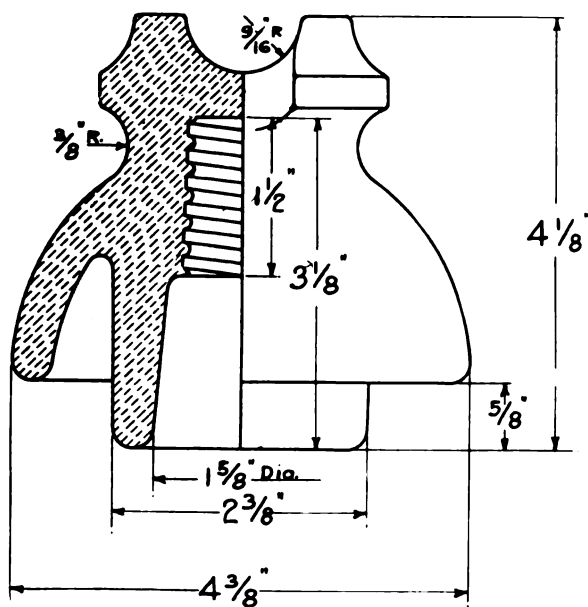
List per 100

\$22 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

11,000 Volts



No. 9406

See description and list on the opposite page.

O-B Porcelain Insulator

11,000 Volts



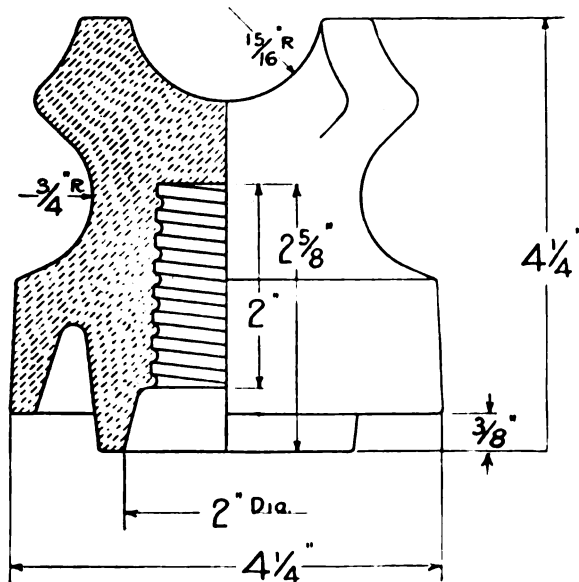
Nos. 9890-11913—For Cable

CATALOGUE NUMBERS		9890	11913
Working Voltage.....		11,000	11,000
Test Voltage.....		40,000	40,000
Leakage Surface.....		4 $\frac{3}{4}$ in.	4 $\frac{1}{4}$ in.
Arcing Distance.....		1 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "
Diameter of Insulator.....		4 $\frac{1}{4}$ "	4 $\frac{1}{4}$ "
Height of Insulator.....		4 $\frac{1}{4}$ "	4 $\frac{5}{16}$ "
Diameter of top groove.....		1 $\frac{7}{8}$ "	1 $\frac{5}{8}$ "
Diameter of side groove.....		1 $\frac{1}{2}$ "	1 $\frac{5}{8}$ "
Use a pin with length above cross arm not less than.....		4 "	4 "
Approximate Net Weight, per 100, in lbs.....		260	260
Approximate Weight packed, per 100, in lbs....		306	306
Approximate Number in barrel.....		100	100
Code Word	No.	List per 100	
Camber.	9890—Insulator for 11,000 Volts, 1 $\frac{3}{8}$ -inch pin hole.....	\$28 00	
Monkfish.	11913— " " 11,000 " 1-inch pin hole.....	28 00	

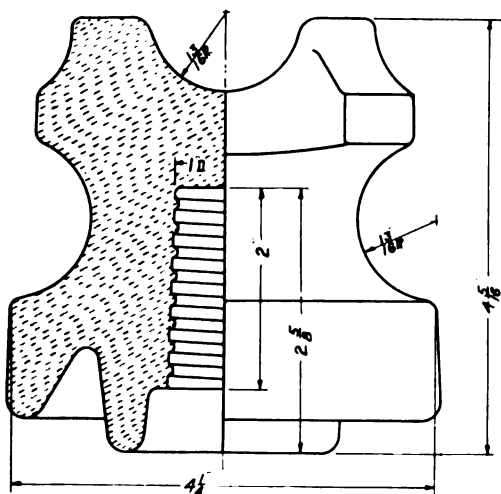
The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

11,000 Volts



No. 9890



No. 11913

See description and list on the opposite page.

O-B Porcelain Insulator

13,000 Volts



No. 10044

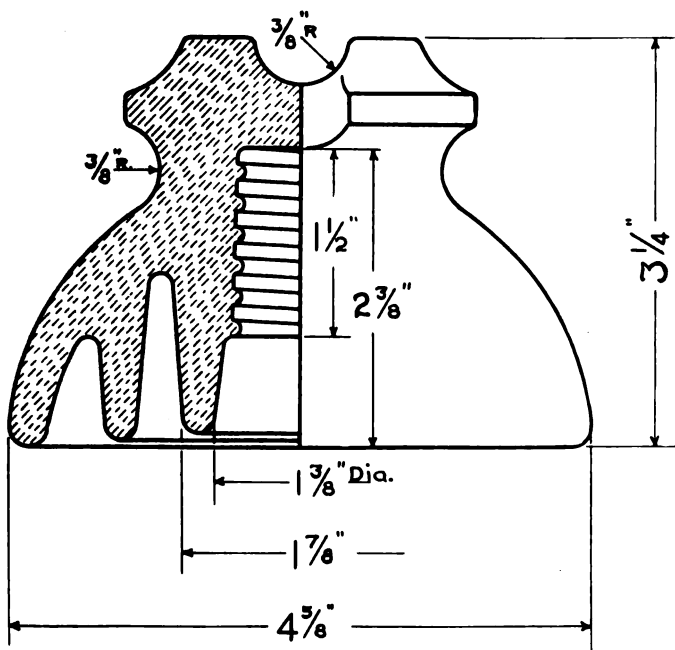
Working Voltage.....	13,000
Test Voltage.....	50,000
Leakage Surface.....	8 in.
Arcing Distance, wet.....	1½ "
Diameter of Insulator.....	4½ "
Height of Insulator.....	3½ "
Diameter of top groove.....	¾ "
Diameter of side groove.....	¾ "
Size of pin hole.....	1 "
Use a 1-inch pin with length above cross arm not less than.....	4 "
Approximate Net Weight, per 100, in lbs.....	176
Approximate Weight packed, per 100, in lbs.....	206
Approximate Number in barrel.....	140

Code Word	No.	List per 100
Footman.	10044—Insulator for 13,000 volts.....	\$27 50

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

13,000 Volts



No. 10044

See description and list on the opposite page.

O-B Porcelain Insulator

17,000 Volts



Nos. 9939-9937

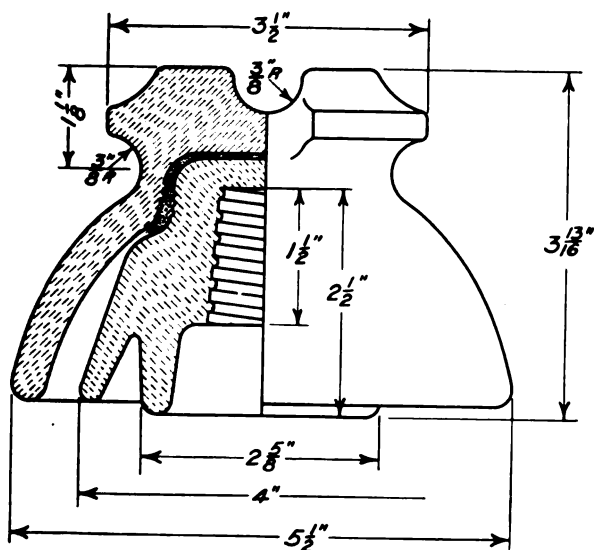
Working Voltage (Catenary Service)*	6,600
Working Voltage (Transmission Service)	17,000
Test Voltage	60,000
Leakage Surface	10 inches
Arcing Distance, wet	1 $\frac{3}{4}$ "
Diameter of Insulator	5 $\frac{1}{2}$ "
Height of Insulator	3 $\frac{1}{8}$ "
Diameter of top groove	$\frac{3}{4}$ "
Diameter of side groove	$\frac{3}{4}$ "
Use a pin with length above cross arm not less than	4 "
Approximate Net Weight, per 100, in lbs	328
Approximate Weight packed, per 100, in lbs	370
Approximate Number in barrel	80

Code Word	No.	List per 100
Forager.	9939—Insulator for 17,000 Volts, 1-inch pin hole	\$38 50
Forceps.	9937— " " 17,000 " 1 $\frac{1}{8}$ -inch pin hole	38 50

*Ground return circuit with full line voltage on a single Insulator.
The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Insulator

17,000 Volts



Nos. 9939-9937

See description and list on the opposite page.

O-B Porcelain Insulator

17,000 Volts



No. 9408

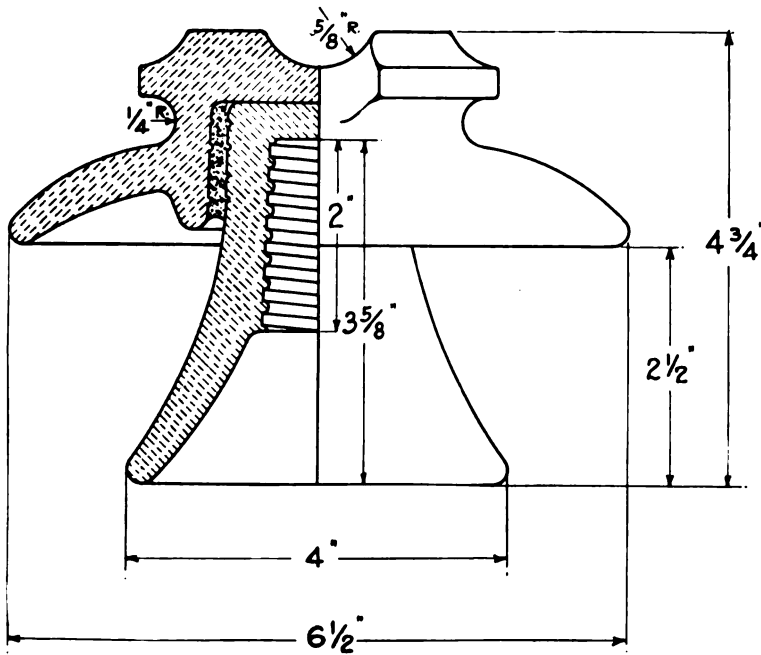
Working Voltage.....	17,000
Test Voltage.....	70,000
Leakage Surface.....	10 inches
Arcing Distance, wet.....	3½ "
Diameter of Insulator.....	6½ "
Height of Insulator.....	4¾ "
Diameter of top groove.....	1½ "
Diameter of side groove.....	½ "
Size of pin hole.....	1 "
Use a 1-inch pin with length above cross arm not less than.....	4¾ "
Approximate Net Weight, per 100, in lbs.....	360
Approximate Weight packed, per 100, in lbs.....	460
Approximate Number in crate.....	80

Code Word	No.	List per 100
<i>Fordable.</i>	9408—Insulator for 17,000 volts.....	\$49 50

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

17,000 Volts

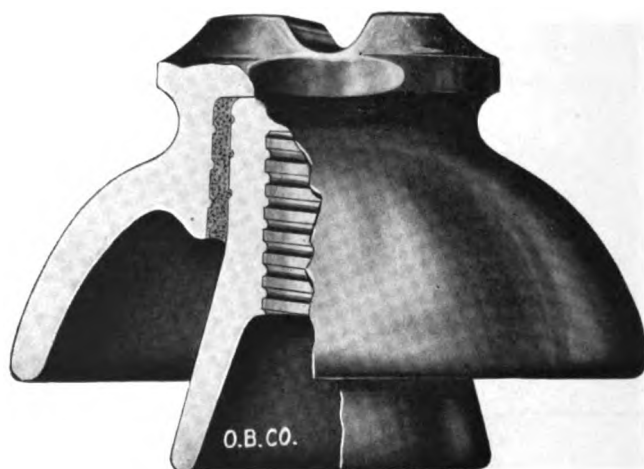


No. 9408

See description and list on the opposite page.

O-B Porcelain Insulator

23,000 Volts



Nos. 11029-11914

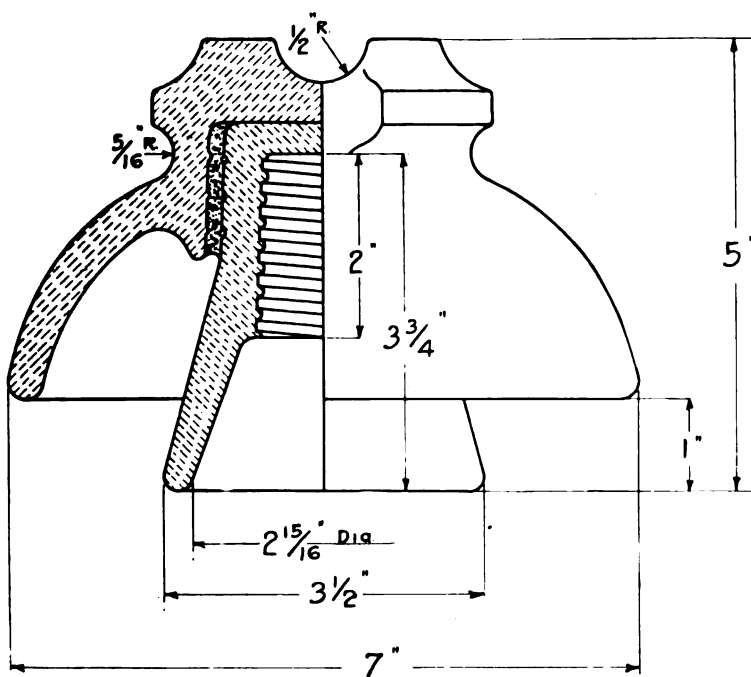
Working Voltage.....	23,000
Test Voltage.....	70,000
Leakage Surface.....	11 inches
Arcing Distance, wet.....	2½ "
Diameter of Insulator.....	7 "
Height of Insulator.....	5 "
Diameter of top groove.....	1 "
Diameter of side groove.....	⅝ "
Use a pin with length above cross arm not less than.....	5 "
Approximate Net Weight, per 100, in lbs.....	452
Approximate Weight packed, per 100, in lbs.....	593
Approximate Number in crate.....	80

Code Word	No.	List per 100
<i>Inopinate.</i>	11029—Insulator for 23,000 Volts, 1½-inch pin hole.....	\$54 00
<i>Monocarp.</i>	11914— " " 23,000 " 1-inch pin hole.....	54 00

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Insulator

23,000 Volts

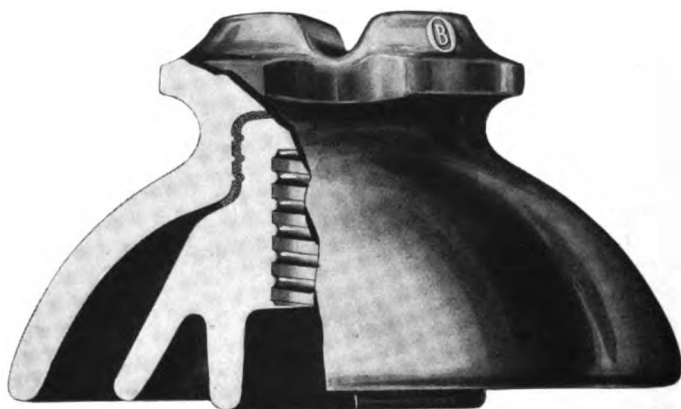


No. 11029-11914

See description and list on the opposite page.

O-B Porcelain Insulator

23,000 Volts



No. 9420

Working Voltage (Catenary Service)*.....	11,000
Working Voltage (Transmission Service).....	23,000
Test Voltage.....	60,000
Leakage Surface.....	11 $\frac{3}{4}$ inches
Arcing Distance, wet.....	2 $\frac{1}{4}$ "
Diameter of Insulator.....	6 $\frac{1}{2}$ "
Height of Insulator.....	4 "
Diameter of top groove.....	$\frac{3}{4}$ "
Diameter of side groove.....	$\frac{5}{8}$ "
Size of pin hole.....	1 $\frac{3}{8}$ "
Use a 1 $\frac{3}{8}$ -inch pin with length above cross arm not less than 5 "	
Approximate Net Weight, per 100, in lbs.....	390
Approximate Weight packed, per 100, in lbs.....	464
Approximate Number in crate.....	100

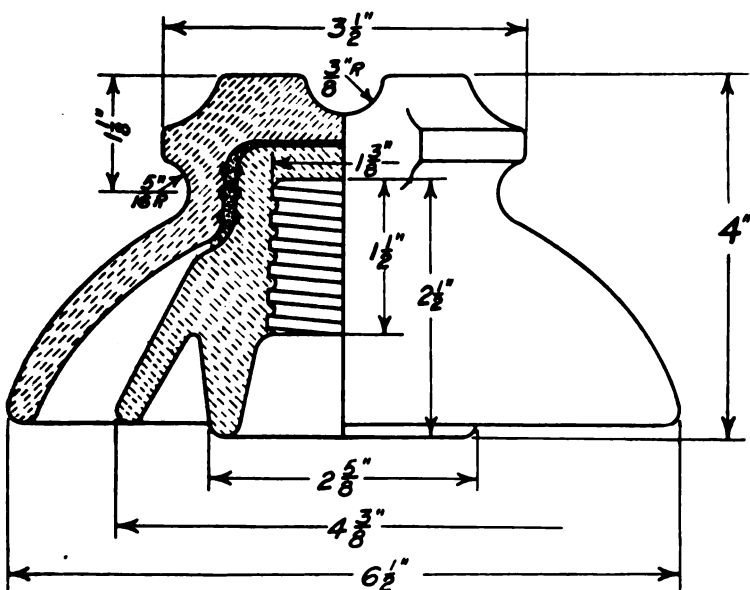
Code Word	No.	List per 100
Foregoer.	9420—Insulator for 23,000 Volts.....	\$50 60

*Ground return circuit with full line voltage on a single Insulator.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Insulator

23,000 Volts



No. 9420

See description and list on the opposite page.

O-B Porcelain Insulator

27,000 Volts

For Catenary Construction



No. 10640

Working Voltage (Catenary Service)*	11,000
Working Voltage (Transmission Service)	27,000
Test Voltage	70,000
Leakage Surface	14½ inches
Arcing Distance, wet	4⅝ "
Diameter of Insulator	9 "
Height of Insulator	5¼ "
Diameter of top groove	7⅞ "
Diameter of side groove	5⅝ "
Size of pin hole	1⅜ "
Use a 1⅜-inch pin with length above bracket not less than	5½ "
Approximate Net Weight, per 100, in lbs.	625
Approximate Weight packed, per 100, in lbs.	775
Approximate Number in crate	22

Code Word	No.	List per 100
Hesper.	10640—Insulator for 27,000 Volts	\$93 50

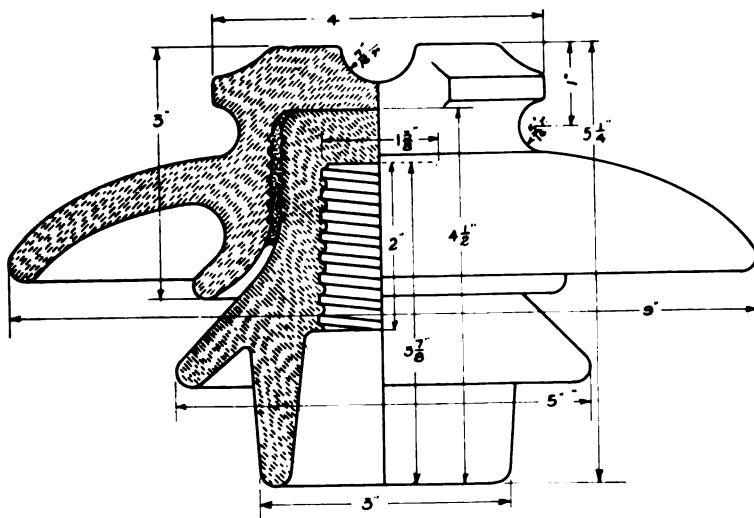
*Ground return circuit with full line voltage on a single Insulator.

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

27,000 Volts

For Catenary Construction



No. 10640

See description and list on the opposite page.

O-B Porcelain Insulator

25,000 Volts



No. 10637

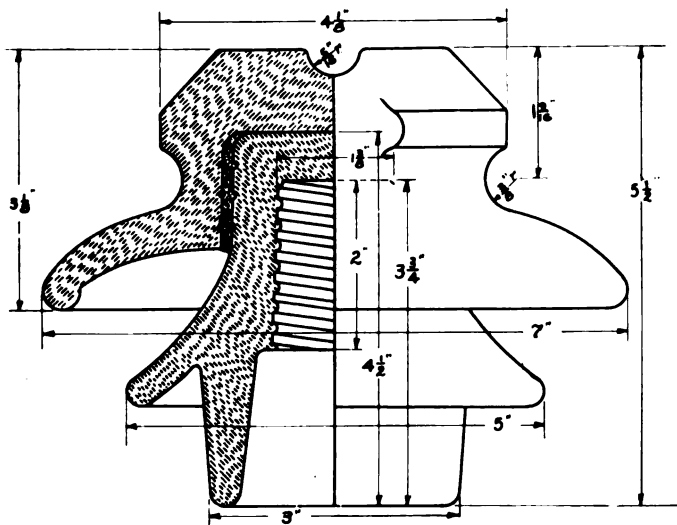
Working Voltage.....	25,000
Test Voltage.....	65,000
Leakage Surface.....	11½ inches
Arcing Distance, Wet.....	3¾ "
Diameter of Insulator.....	7 "
Height of Insulator.....	5½ "
Diameter of Top Groove.....	¾ "
Diameter of Side Groove.....	¾ "
Size of Pin Hole.....	1¾ "
Use a 1¾-inch pin with length above cross arm not less than....	5 "
Approximate Net Weight, per 100, in lbs.....	500
Approximate Weight Packed, per 100, in lbs.....	561
Approximate Number in crate.....	40

Code Word	No.	List per 100
<i>Hesitant.</i>	10637—Insulator for 25,000 Volts.....	\$60 50

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

25,000 Volts



No. 10637

See description and list on the opposite page.

O-B Porcelain Insulator**27,000 Volts****No. 9410**

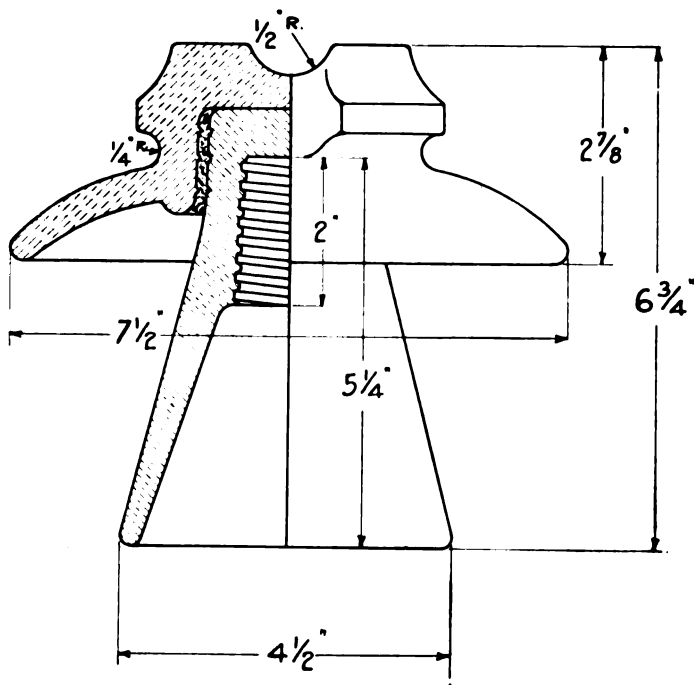
Working Voltage	27,000
Test Voltage	80,000
Leakage Surface	13 inches
Arcing Distance, wet	3½ "
Diameter of Insulator	7½ "
Height of Insulator	6¾ "
Diameter of top groove	1 "
Diameter of side groove	½ "
Size of pin hole	1⅜ "
Use a 1⅜-inch pin with length above cross arm not less than.	7 "
Approximate Net Weight, per 100, in lbs.	467
Approximate Weight packed, per 100, in lbs.	678
Approximate Number in crate	64

Code Word	No.	List per 100
Forehand.	9410—Insulator for 27,000 volts.	\$59 60

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

27,000 Volts

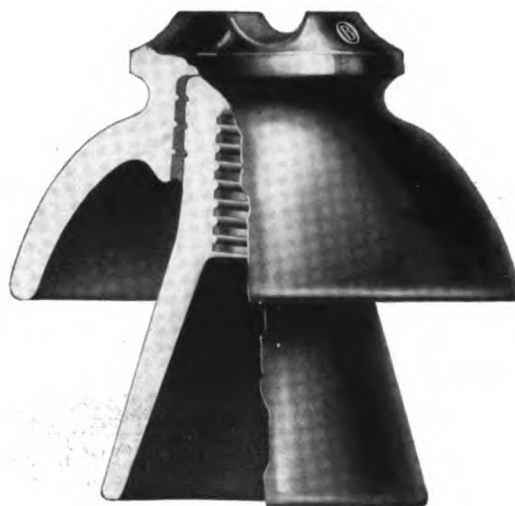


No. 9410

See description and list on the opposite page.

O-B Porcelain Insulator

27,000 Volts



No. 11031

Working Voltage.....	27,000
Test Voltage.....	80,000
Leakage Surface.....	15 in.
Arcing Distance, wet.....	3½ "
Diameter of Insulator.....	7 "
Height of Insulator.....	6½ "
Diameter of top groove.....	1 "
Diameter of side groove.....	⅝ "
Size of pin hole.....	1⅜ "
Use a 1½-inch pin with length above cross arm not less than.....	7 "
Approximate Net Weight, per 100, in lbs.....	575
Approximate Weight packed, per 100, in lbs.....	728
Approximate Number in crate.....	64

Code Word
Inosile.

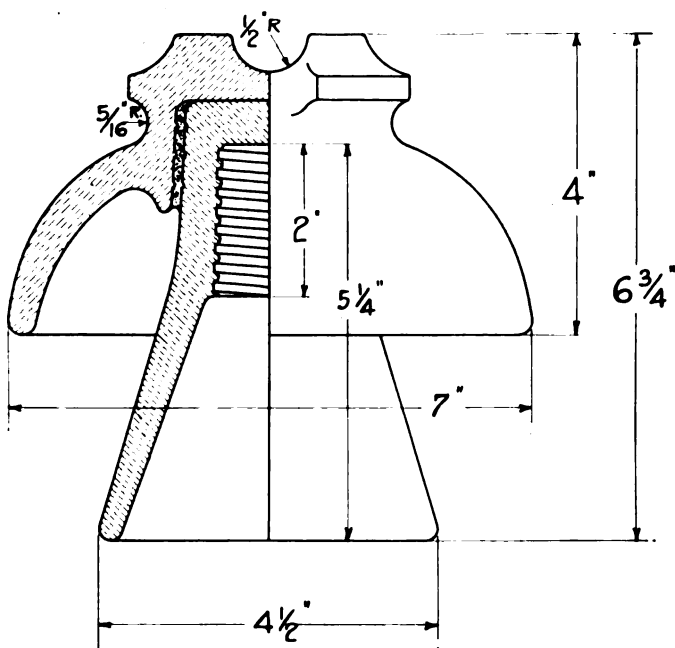
No.
11031—Insulator for 27,000 volts

List per 100
\$60 50

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

27,000 Volts

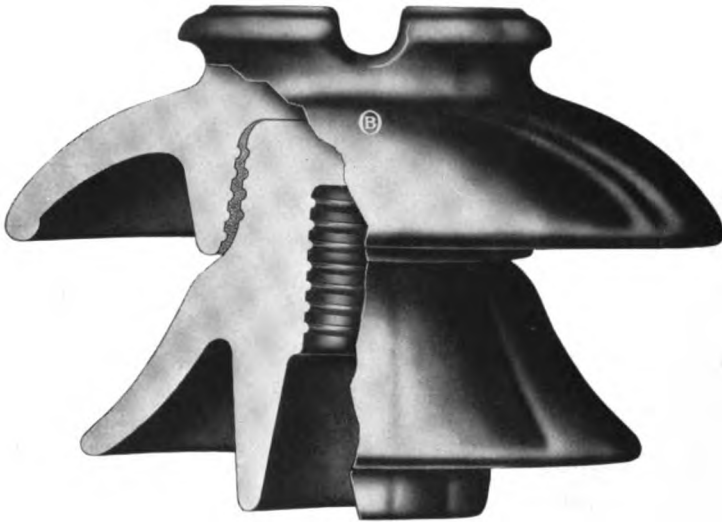


No. 11031

See description and list on the opposite page.

O-B Porcelain Insulator

35,000 Volts



No. 11622

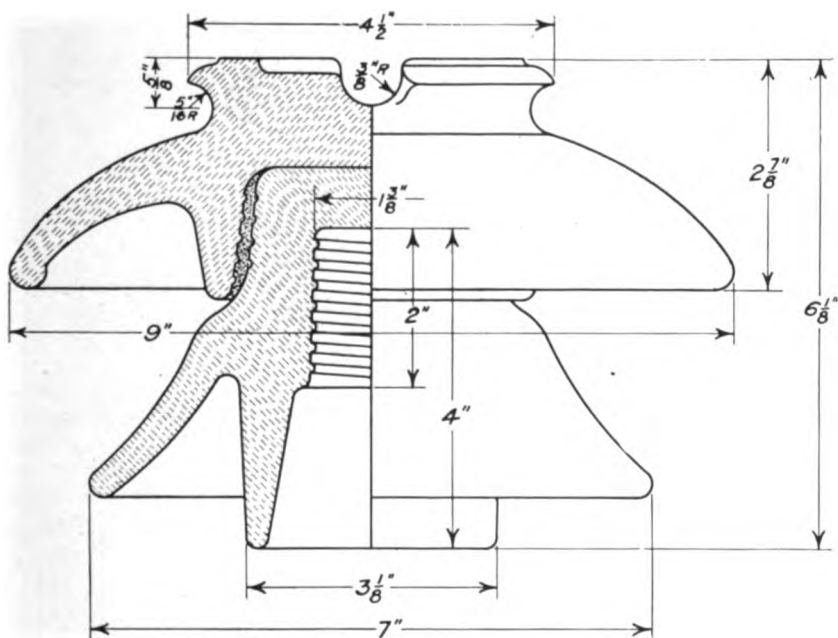
Working Voltage.....	35,000
Test Voltage.....	125,000
Leakage Surface.....	17 inches
Arcing Distance, wet.....	5 $\frac{3}{4}$ "
Diameter of Insulator.....	9 "
Height of Insulator.....	6 $\frac{1}{8}$ "
Diameter of top groove.....	$\frac{3}{4}$ "
Diameter of side groove.....	$\frac{5}{8}$ "
Size of pin hole.....	1 $\frac{3}{8}$ "
Use a 1 $\frac{3}{8}$ -inch pin with length above cross arm not less than 6	"
Approximate Net Weight, per 100, in lbs.....	885
Approximate Weight packed, per 100, in lbs.....	1205
Approximate Number in crate.....	36

Code Word	No.	List per 100
<i>Monolith.</i>	11622—Insulator for 35,000 Volts.....	\$115 50

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Insulator

35,000 Volts



No. 11622

See description and list on the opposite page.

O-B Porcelain Insulator

35,000 Volts



Nos. 9894-9413

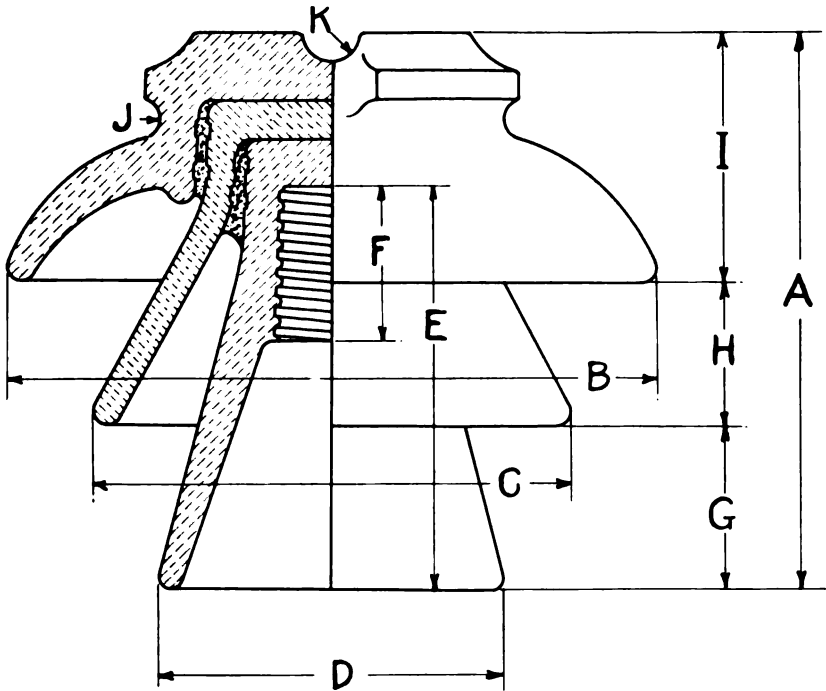
CATALOGUE NUMBERS	9894	9413
Working Voltage	35,000	35,000
Test Voltage	110,000	100,000
Leakage Surface	21 $\frac{3}{8}$ in.	20 $\frac{5}{8}$ in.
Arcing Distance, wet.	4 $\frac{3}{8}$ "	4 $\frac{1}{4}$ "
Diameter of Insulator	8 $\frac{1}{2}$ "	8 $\frac{1}{2}$ "
Height of Insulator	8 "	7 $\frac{1}{4}$ "
Diameter of top groove	$\frac{3}{4}$ "	$\frac{3}{4}$ "
Diameter of side groove	$\frac{1}{2}$ "	$\frac{1}{2}$ "
Size of pin hole	1 $\frac{3}{8}$ "	1 $\frac{3}{8}$ "
Use a 1 $\frac{3}{8}$ -inch pin with length above cross arm not less than	9 "	7 "
Approximate Net Weight, per 100, in lbs	958	848
Approximate Weight packed, per 100, in lbs	1244	1062
Approximate Number in crate	48	48

Code Word	No.	List per 100
Forest.	9894—Insulator for 35,000 volts	\$104 50
Forestal.	9413— " " 35,000 "	99 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

35,000 Volts



Nos. 9894-9413

Dimensions in Inches

Cat. No.	A	B	C	D	E	F	G	H	I	J	K
9894	8	8½	6½	5	6½	2	2½	1½	3½	½	¾
9413	7½	8½	6½	4½	5½	2	2½	1½	3½	½	¾

See description and list on the opposite page.

O-B Porcelain Insulator

45,000 Volts



No. 11623

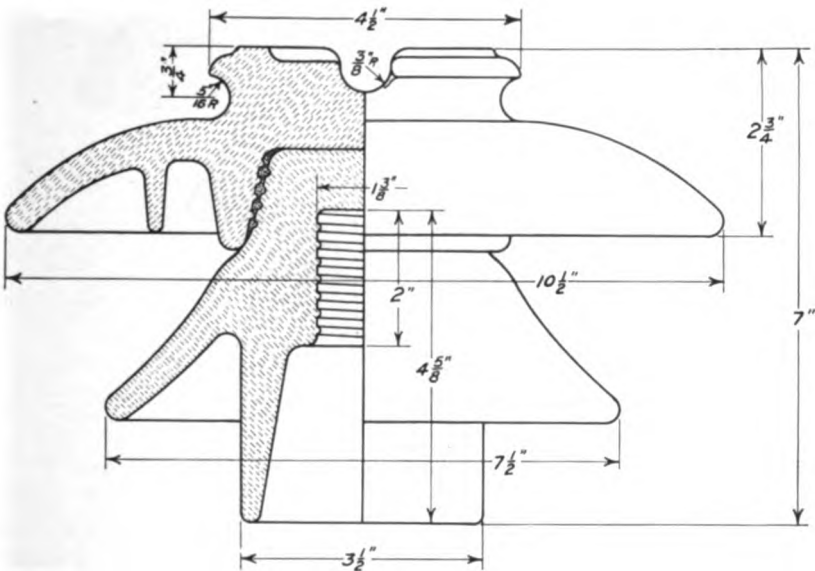
Working Voltage.....	45,000
Test Voltage.....	145,000
Leakage Surface.....	21½ inches
Arcing Distance, wet.....	7 "
Diameter of Insulator.....	10½ "
Height of Insulator.....	7 "
Diameter of top groove.....	¾ "
Diameter of side groove.....	⅝ "
Size of pin hole.....	1⅜ "
Use a 1⅜-inch pin with length above cross arm not less than	7½ "
Approximate Net Weight, per 100, in lbs.....	1100
Approximate Weight packed, per 100, in lbs.....	1460
Approximate Number in crate.....	36

Code Word	No.	List per 100
<i>Monomial.</i>	11623—Insulator for 45,000 Volts.....	\$176 00

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Insulator

45,000 Volts

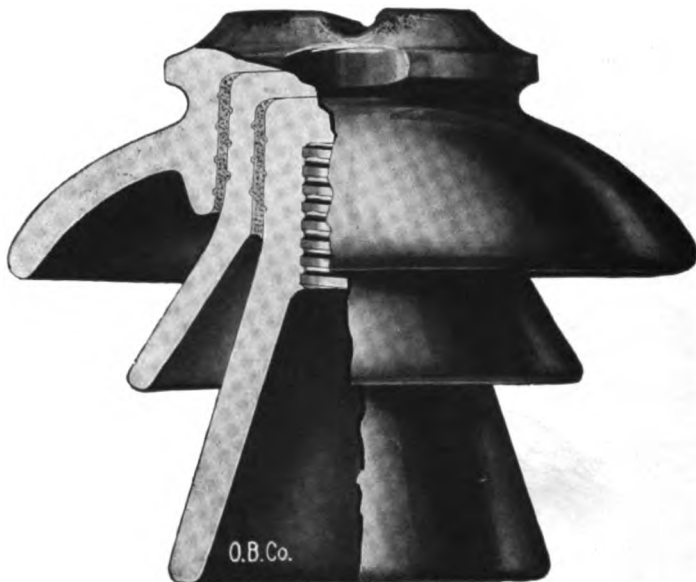


No. 11623

See description and list on the opposite page.

O-B Porcelain Insulator

45,000 Volts



No. 9416

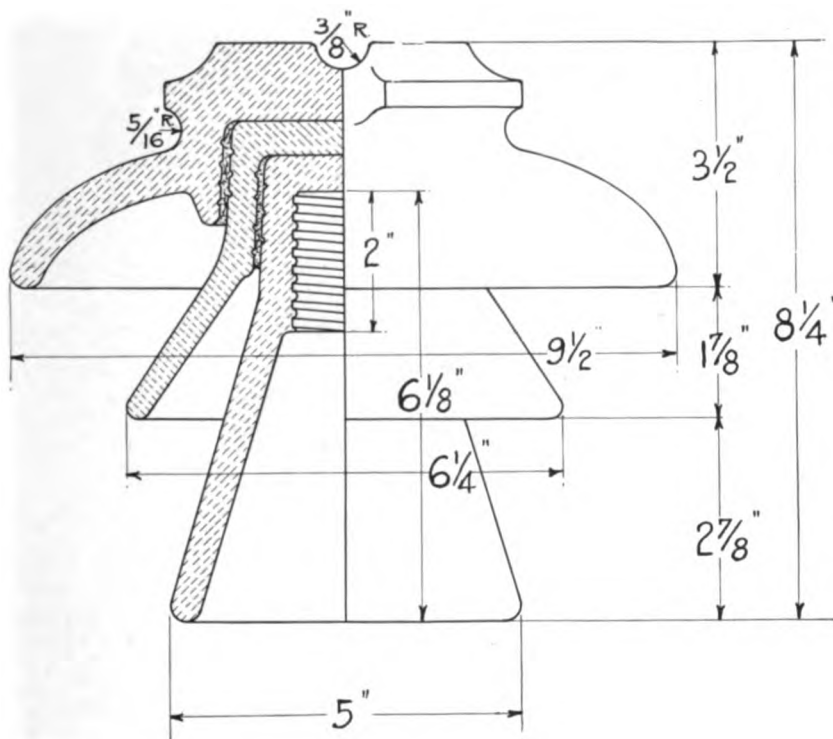
Working Voltage.....	45,000
Test Voltage.....	110,000
Leakage Surface.....	22 inches
Arcing Distance, wet.....	4½ "
Diameter of Insulator.....	9½ "
Height of Insulator.....	8½ "
Diameter of top groove.....	4½ "
Diameter of side groove.....	4½ "
Size of pin hole.....	1½ "
Use a 1½-inch pin with length above cross arm not less than....	9 "
Approximate Net Weight, per 100, in lbs.....	1050
Approximate Weight packed, per 100, in lbs.....	1400
Approximate Number in crate.....	27

Code Word	No.	List per 100
<i>Forgeman.</i>	9416—Insulator for 45,000 volts.....	\$115 50

The actual voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

45,000 Volts

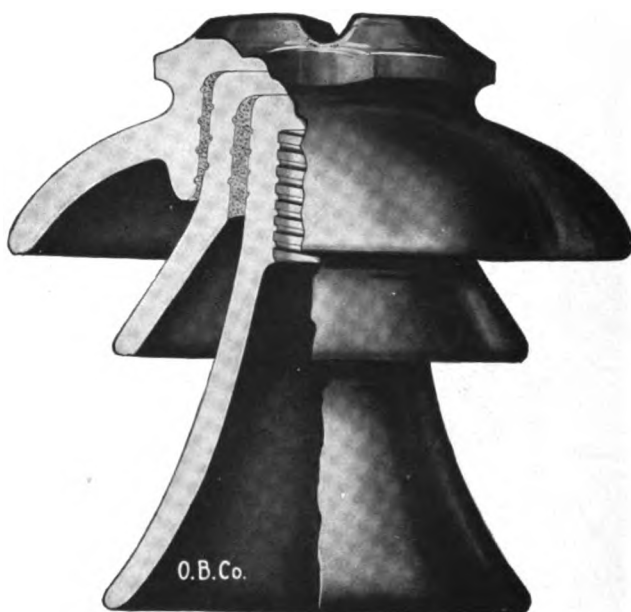


No. 9416

See description and list on the opposite page.

O-B Porcelain Insulator

45,000 Volts



No. 9417

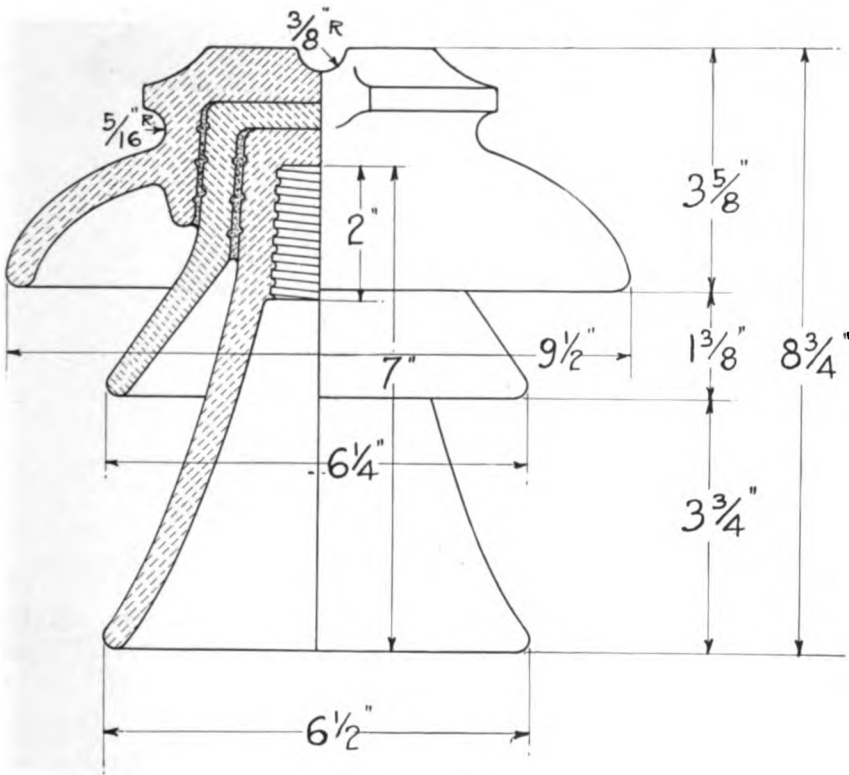
Working Voltage.....	45,000
Test Voltage.....	120,000
Leakage Surface.....	24½ inches
Arcing Distance, wet.....	5½ "
Diameter of Insulator.....	9½ "
Height of Insulator.....	8½ "
Diameter of top groove.....	¾ "
Diameter of side groove.....	¾ "
Size of pin hole.....	1 3/8 "
Use a 1½-inch pin with length above cross arm not less than....	9 "
Approximate Net Weight, per 100, in lbs.....	1140
Approximate Weight packed, per 100, in lbs.....	1464
Approximate Number in crate.....	27

Code Word	No.	List per 100
Forkless.	9417—Insulator for 45,000 volts.....	\$132 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

45,000 Volts



No. 9417

See description and list on the opposite page.

O-B Porcelain Insulator

50,000 Volts



No. 10638

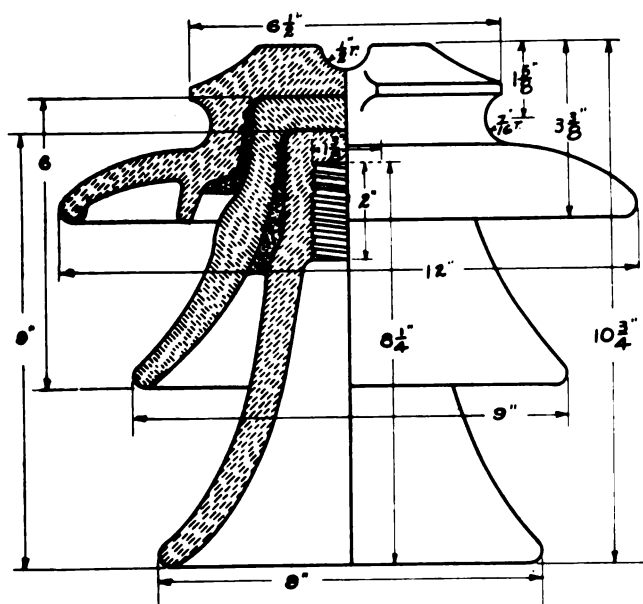
Working Voltage	50,000
Test Voltage	150,000
Leakage Surface	31 inches
Arcing Distance, wet	8½ "
Diameter of Insulator	12 "
Height of Insulator	10¾ "
Diameter of top groove	1 "
Diameter of side groove	¾ "
Size of pin hole	1½ "
Use a 1½-inch pin with length above cross arm not less than 12 "	
Approximate Net Weight, per 100, in lbs	2267
Approximate Weight packed, per 100, in lbs	3131
Approximate Number in crate	3

Code Word	No.	List per 100
Hessian.	10638—Insulator for 50,000 Volts	\$281 50

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Insulator

50,000 Volts

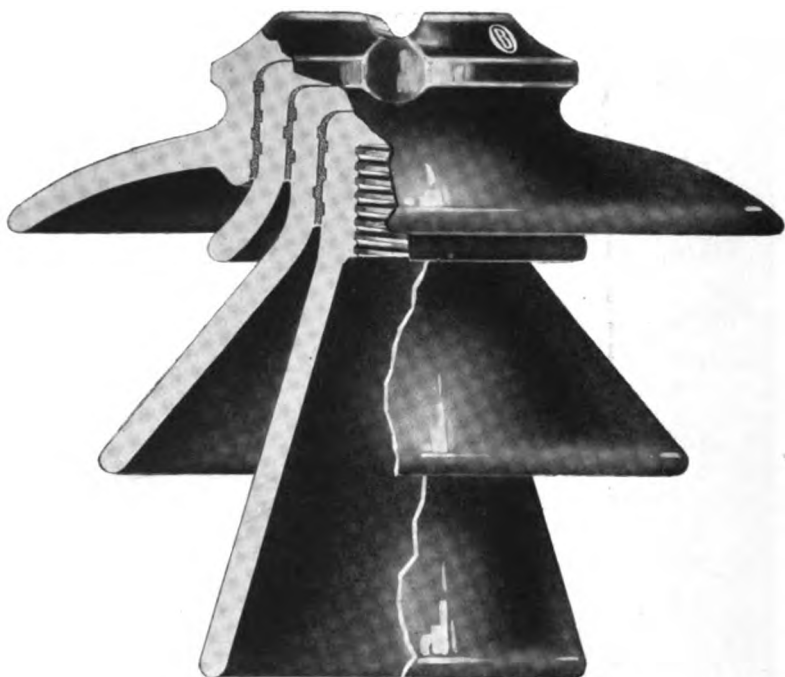


No. 10638

See description and list on the opposite page.

O-B Porcelain Insulator

60,000 Volts



No. 9418

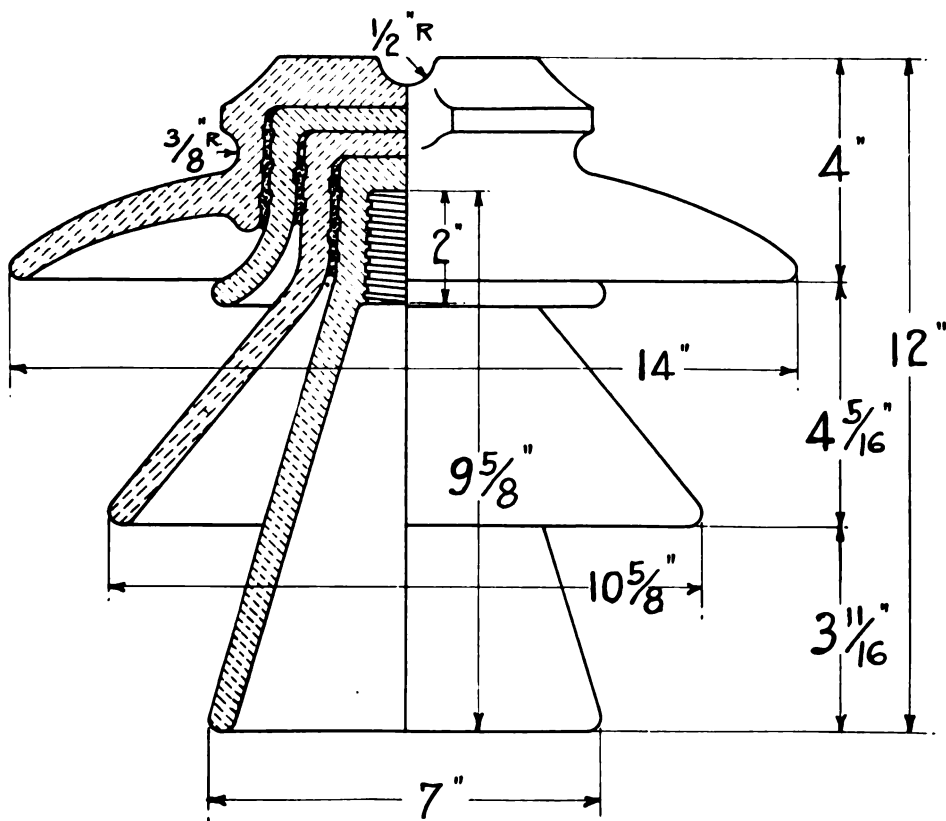
Working Voltage.....	60,000
Test Voltage.....	150,000
Leakage Surface.....	43½ in.
Arcing Distance, wet.....	8¾ "
Diameter of Insulator.....	14 "
Height of Insulator.....	12 "
Diameter of top groove.....	1 "
Diameter of side groove.....	¾ "
Size of pin hole.....	1½ "
Use a 1½-inch pin with length above cross arm not less than....	12 "
Approximate Net Weight, per 100, in lbs.....	2936
Approximate Weight packed, per 100, in lbs.....	3771
Approximate Number in crate.....	3

Code Word	No.	List per 100
Forted.	9418—Insulator for 60,000 volts.....	\$346 50

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

60,000 Volts



No. 9418

See description and list on the opposite page.

O-B Porcelain Insulator

66,000 Volts



No. 10639

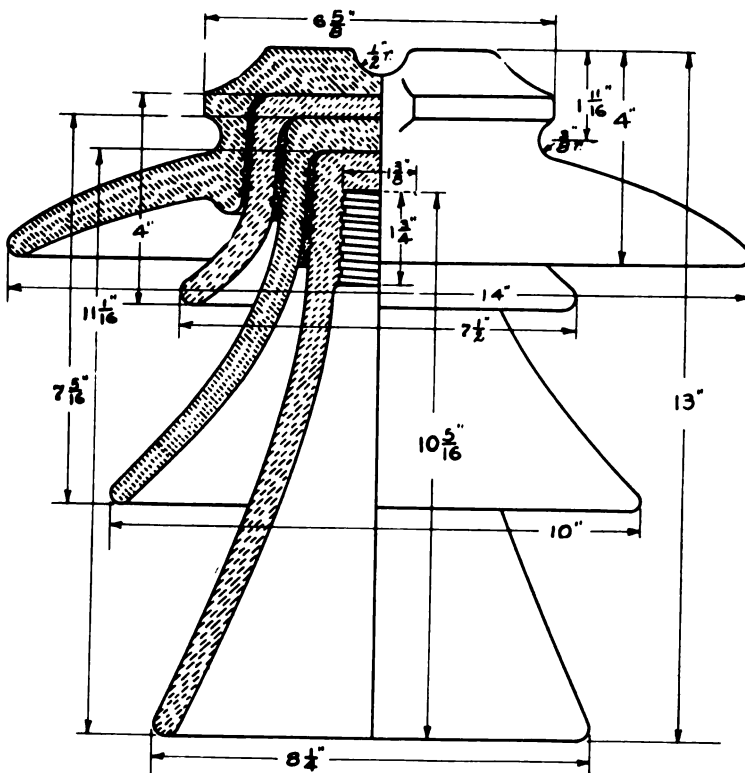
Working Voltage.....	66,000
Test Voltage.....	150,000
Leakage Surface.....	.45 inches
Arcing Distance, Wet.....	9½ "
Diameter of Insulator.....	14 "
Height of Insulator.....	13 "
Diameter of Top Groove.....	1 "
Diameter of Side Groove.....	¾ "
Size of Pin Hole.....	1⅛ "
Use a 1⅜-inch pin with length above cross arm not less than....	14 "
Approximate Net Weight, per 100, in lbs.....	3100
Approximate Weight Packed, per 100, in lbs.....	3872
Approximate Number in crate.....	3

Code Word	No.	List per 100
Heved.	10639—Insulator for 66,000 Volts.....	\$385 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

66,000 Volts



No. 10639

See description and list on the opposite page.

O-B Porcelain Insulator

70,000 Volts



No. 10748

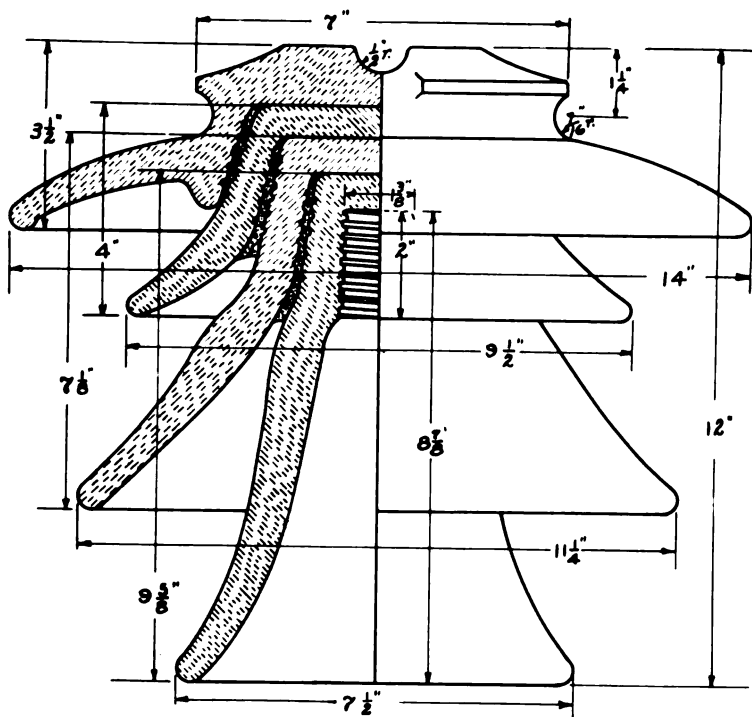
Working Voltage.....	70,000
Test Voltage.....	175,000
Leakage Surface.....	40½ inches
Arcing Distance, wet.....	10 "
Diameter of Insulator.....	14 "
Height of Insulator.....	12 "
Diameter of top groove.....	1 "
Diameter of side groove.....	$\frac{7}{8}$ "
Size of pin hole.....	$1\frac{3}{8}$ "
Use a $1\frac{3}{8}$ -inch pin with length above cross arm not less than 12	"
Approximate Net Weight, per 100, in lbs.....	3300
Approximate Weight packed, per 100, in lbs.....	4100
Approximate Number in crate.....	3

Code Word	No.	List per 100
Hewer.	10748—Insulator for 70,000 Volts.....	\$460 00

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Insulator

70,000 Volts



No. 10748

See description and list on the opposite page.

O-B Porcelain Insulator

80,000 Volts



No. 10577

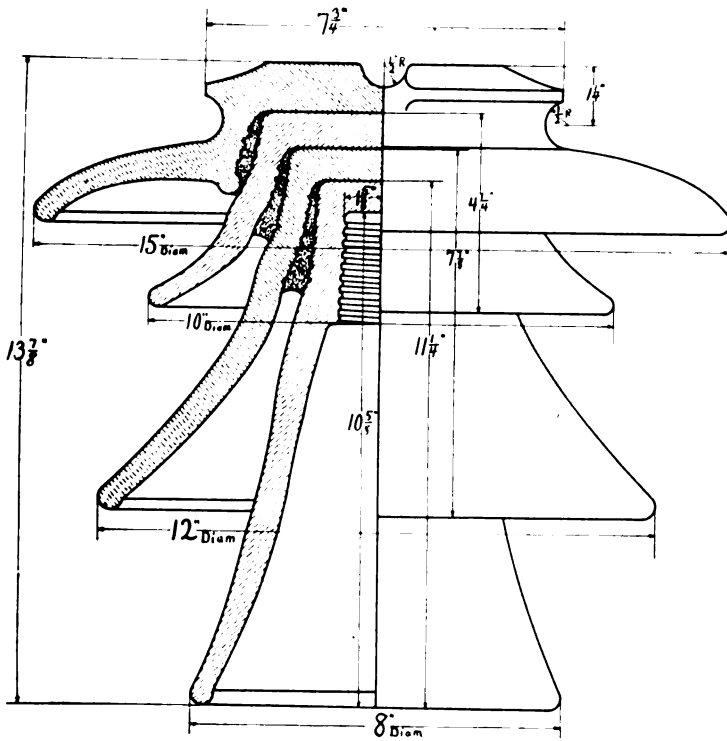
Working Voltage.....	80,000
Test Voltage.....	190,000
Leakage Surface.....	47 $\frac{3}{4}$ in.
Arcing Distance, wet.....	11 $\frac{5}{8}$ "
Diameter of Insulator.....	15 "
Height of Insulator.....	13 $\frac{7}{8}$ "
Diameter of top groove.....	1 "
Diameter of side groove.....	1 "
Size of pin hole.....	1 $\frac{5}{8}$ "
Use a 1 $\frac{5}{8}$ -inch pin with length above cross arm not less than....	14 "
Approximate Net Weight, per 100, in lbs.....	3786
Approximate Weight packed, per 100, in lbs.....	5353
Approximate Number in crate.....	3

Code Word	No.	List per 100
Founder.	10577—Insulator for 80,000 volts.....	\$595 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Insulator

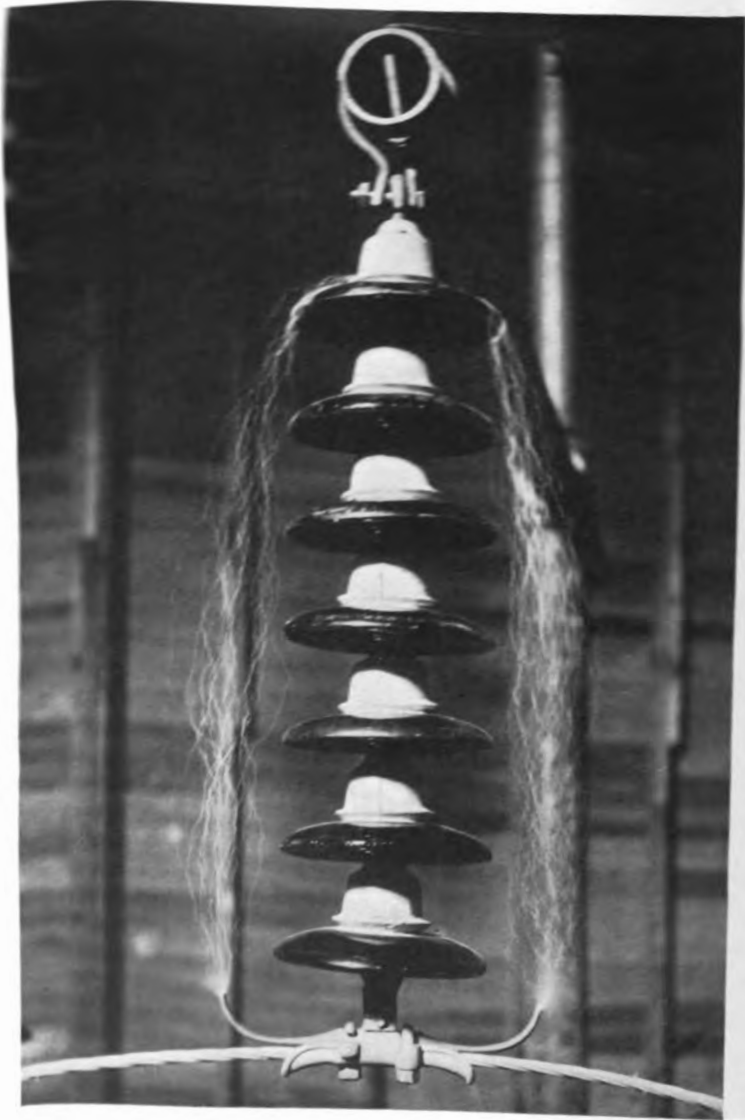
80,000 Volts



No. 10577

See description and list on the opposite page.

O-B Suspension Porcelain Insulator



O-B Suspension Insulator, 7 units, flashing over at 375,000 volts.
Path of arc is well away from Insulator, showing high efficiency
of O-B Designs.

O-B Suspension Porcelain Insulators

Patented

General Description

THE weight, difficulty of manufacture and cost of a pin type Insulator, increase approximately as the cube of the rating. Therefore, for the higher voltages it has been found necessary to develop an Insulator which will be more efficient, and the first problems which confront the designer are distribution of the porcelain so that each part of the Insulator will bear, as far as possible, its portion of the electrostatic stress and also that all parts will be in as weak an electrostatic field as possible.

The result of our investigations is the O-B Suspension Insulator in which the weight and cost increase directly with the rating for general working requirements.

The O-B Suspension Insulator consists of a one-piece porcelain disc with concentric circular ribs or petticoats on the under surface, a galvanized malleable cap casting which is securely cemented to the projecting head of the porcelain disc, and a galvanized forged steel center pin cemented in a pin hole which extends well into the head of the porcelain disc.

In this design it has been our aim to secure an Insulator in which the electrical and mechanical characteristics are properly balanced, and we have secured maximum insulation, reliability and mechanical strength for the length and weight of the Insulator.

The Insulator may consist of one or of several Units, the number depending upon line voltage, local conditions and the factor of safety or reliability desired by the user.

An efficient and convenient connection between Units is made by a patented ball and socket joint. Each Insulator Unit is an exact duplicate of the others.

Type A and Type B Insulators differ from each other in details of design only. The Type B, Form 1 is considerably higher in ultimate mechanical strength than the Type A, Form 1, although slightly lower than the Type A, Form 2. The spacing between units in the Type B, Form 1 is less than either the Type A, Form 1 or 2.

Type D Insulator differs from Type A, Form 1 only in the form of connection used, the porcelain disc being identical.

See listing on the following pages.

O-B Suspension Porcelain Insulator

Type A, Form 1—Patented

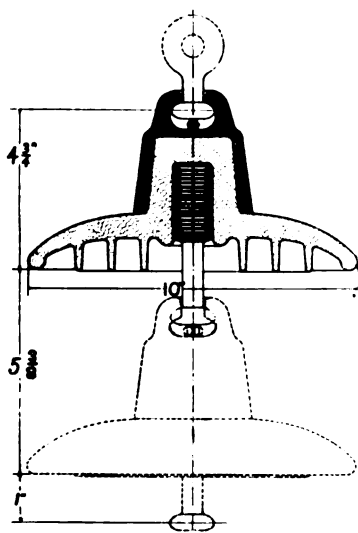


Two Units connected; lower Unit shown in section.

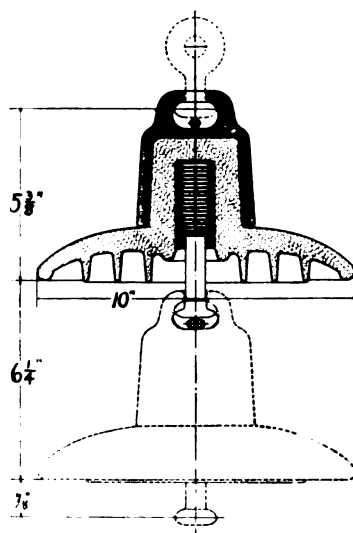
See description and list on the opposite page.

O-B Suspension Porcelain Insulators

Type A, Forms 1 and 2—Patented



Suspension Insulator No. 10566



Suspension Strain Insulator No. 10567

All castings are malleable iron, galvanized.

Type A, Form 1, Suspension Insulator—No. 10566

Number of Units	1	2	3	4	5	6
Length of Complete Insulator in inches.....	5 ³ / ₈	10 ³ / ₄	16 ¹ / ₈	21 ¹ / ₂	26 ⁷ / ₈	32 ¹ / ₄
Net Weight per Complete Insulator in pounds..	9	18	27	36	45	54
Packed Weight per Complete Insulator in pounds	13	24	33	43	53	65

Code Word No. List per 100
Hagborn. 10566—Type A, Form 1 Suspension Insulator, single unit.....\$187 00

Type A, Form 2, Suspension Strain Insulator—No. 10567

Number of Units	1	2	3	4	5	6
Length of Complete Insulator in inches.....	6 ¹ / ₄	12 ¹ / ₂	18 ³ / ₄	25	31 ¹ / ₄	37 ¹ / ₂
Net Weight per Complete Insulator in pounds..	10	20	30	40	50	60
Packed Weight per Complete Insulator in pounds	14	27	38	49	61	73

Code Word No. List per 100
Hagbut. 10567—Type A, Form 2 Suspension Strain Insulator, single unit..\$231 00

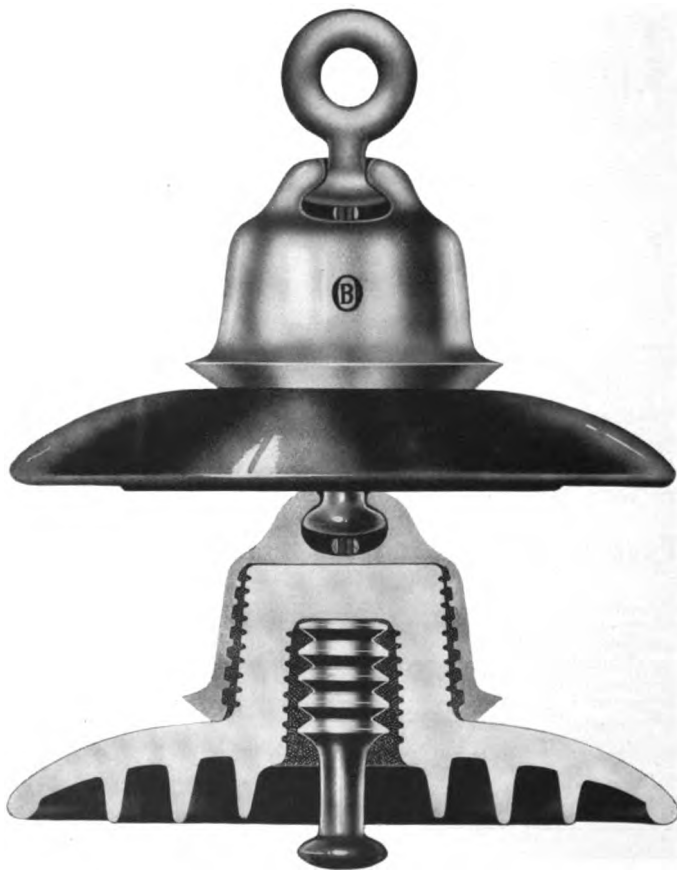
The actual working voltage should be specified on all orders or inquiries.

Note: Insulator Hardware is not interchangeable between Type A and Type B Suspension Insulators. See pages 372 to 386 for listing of Insulator Hardware.

See general description on page 311.

O-B Suspension Porcelain Insulator

Type B, Form 1—Patented

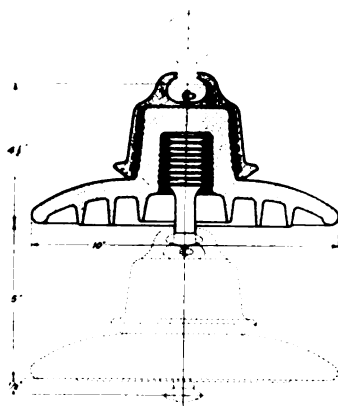


Two Units connected; lower Unit shown in section.

See description and list on the opposite page.

O-B Suspension Porcelain Insulator

Type B, Form 1—Patented



Suspension Insulator No. 11535

All castings are malleable iron, galvanized.

Type B Suspension Insulator—No. 11535

Number of Units	1	2	3	4	5	6
Length of Complete Insulator in inches.....	5	10	15	20	25	30
Net Weight per Complete Insulator in pounds..	9½	19	28½	38	47½	57
Packed Weight per Complete Insulator in pounds	15	25	35	45	56	66

Code Word No. List per 100
Monsoon. 11535—Type B Suspension Insulator, single unit\$209 00

The actual working voltage should be specified on all orders or inquiries.

Note: Insulator Hardware is not interchangeable between Type B and Type A Suspension Insulators. See pages 372 to 386 for listing of Insulator Hardware.

See general description on page 311.

O-B Suspension Porcelain Insulator

Type D

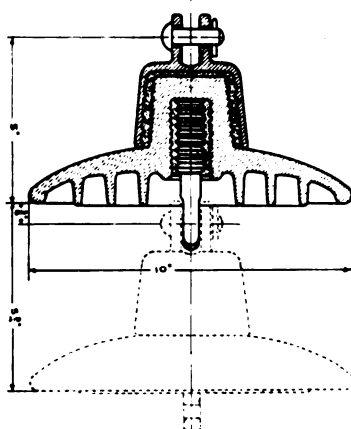


Two Type D Units connected; lower unit shown in section

See opposite page for listing.

O-B Suspension Porcelain Insulator

Type D



THIS type of Insulator can be supplied when conditions demand, though the clevis form of connection lacks the distinctive advantages possessed by the ball and socket connection used on the Types A and B Insulators.

The porcelain disc is identical with that used in the Type A, Form 1 Insulator.

Extra cotter pins are furnished with each unit.

All castings are malleable iron, galvanized.

Number of Units	1	2	3	4	5	6
Length of Complete Insulator in inches.....	5 ³ / ₄	11 ¹ / ₂	17 ¹ / ₄	23	28 ³ / ₄	34 ¹ / ₂
Net Weight per Complete Insulator in pounds..	8 ¹ / ₂	17	25 ¹ / ₂	34	42 ¹ / ₂	51
Packed Weight per Complete Insulator in pounds	12 ¹ / ₂	23	31 ¹ / ₂	41 ¹ / ₄	50 ³ / ₄	62 ¹ / ₂

Code Word	No.	List per 100
Montanic.	11936—Type D Suspension Insulator, single unit.....	\$187 00

The actual working voltage should be specified on all orders or inquiries.

See pages 372 to 386 for listing of Insulator Hardware.

See general description on page 311.

O-B Suspension Porcelain Insulator

Type A, Form 3—Patented



No. 11033

CAN be attached to support by means of fittings listed on page 386 or by a regular hex or square head $\frac{5}{8}$ -inch machine bolt.

Very convenient to install or replace on line, as all connections can be made before Insulator is put in place.

All castings are malleable iron, galvanized.

Working Voltage (Catenary Service)*.....	6,600
Working Voltage (Transmission Service).....	11,000
Test Voltage.....	75,000
Ultimate Strength in lbs.....	8,000
Diameter of Insulator in inches.....	7
Height of Insulator† in inches.....	5 $\frac{3}{4}$
Approximate Net Weight, per 100, in lbs.....	740
Approximate Weight Packed, per 100, in lbs.....	900
Approximate Number in Barrel.....	24

Code Word	No.	List per 100
<i>Knoller.</i>	11033—Type A, Form 3 Insulator, for 11,000 Volts, single unit...	\$165 00

*Ground return circuit with full line voltage between wire and ground.

†Height is measured from center of ball on pin to center of socket in cap.

The actual working voltage should be specified on all orders or inquiries.

O-B Suspension Porcelain Insulators

Type A, Forms 4 and 5—Patented



Form 4, No. 10955



Form 5, No. 10956

All castings are malleable iron, galvanized.

Catalogue Numbers	10955	10956
Working Voltage (Catenary Service)*.....	6,600	6,600
Working Voltage (Transmission Service).....	11,000	11,000
Test Voltage.....	75,000	85,000
Ultimate Strength in Pounds.....	12,000	12,000
Diameter of Insulator, in inches.....	7	10
Opening in Clevis, in inches.....	$\frac{1}{2}$	$\frac{1}{2}$
Height, Center Tower Eye to Center Clevis Bolt.....	$9\frac{3}{4}$	$9\frac{3}{4}$
Approximate Net Weight, per 100, in lbs.....	1,051	1,200
Approximate Weight Packed, per 100, in lbs....	1,240	1,400
Approximate Number in barrel.....	24	12

Code Word	No.	List per 100
<i>Inquinate.</i>	10955—Form 4, Strain Insulator complete for 11,000 Volts.....	\$275 00
<i>Inquirance.</i>	10956— " 5 " " " 11,000 "	301 40
<i>Inquisible.</i>	10957— " 4 Insulator only for 11,000 Volts.....	204 60
<i>Hagbut.</i>	10567— " 5 " " " 11,000 "	231 00
<i>Invacuo.</i>	11106—Suspension Eye, Drop Forged Steel, Galvanized, $\frac{1}{2}$ -inch Hole.....	21 45
<i>Horation.</i>	10758—Socket Clevis, Malleable Iron, Galvanized, $\frac{1}{2}$ -inch Bolt....	37 40

*Ground return circuit with full line voltage between wire and ground.
The actual working voltage should be specified on all orders or inquiries.

O-B Suspension Porcelain Insulators

Type C, Form 1—Strain



No. 11034



No. 11937

All castings are malleable iron, galvanized.

CATALOGUE NUMBERS	11034	11937
Working Voltage (Catenary Service)*.....	6,600	6,600
Working Voltage (Transmission Service).....	11,000	11,000
Test Voltage.....	75,000	85,000
Ultimate Strength in lbs.....	8,000	8,000
Diameter of Insulator in Inches.....	7	10
Height of Insulator in Inches†.....	6½	6½
Diameter of Eyes in Inches.....	1	1
Approximate Net Weight, per 100, in lbs.....	725	875
Approximate Weight Packed, per 100, in lbs....	900	1,200
Approximate Number in Barrel.....	24	12

Code Word	No.	List per 100
<i>Inquireline.</i>	11034—Type C, Form 1, Strain Insulator, for 11,000 Volts, single unit	\$165 00
<i>Monureid.</i>	11937—Type C, Form 1, Strain Insulator, for 11,000 Volts, single unit	198 00

*Ground return circuit with full line voltage between wire and ground.

†Height is measured from center to center of eyes.

The actual working voltage should be specified on all orders or inquiries.

O-B Suspension Porcelain Insulators

Patented

Type CA—Strain



No. 11938



No. 11939

All castings are malleable iron, galvanized.

Catalogue Numbers	11938	11939
Working Voltage (Catenary Service)*.....	11,000	11,000
Working Voltage (Transmission Service).....	22,000	22,000
Test Voltage, per single unit.....	75,000	85,000
Ultimate Strength in Pounds.....	8,000	8,000
Diameter of Insulator, in inches.....	7	10
Height, center to center of Eyes, in inches.....	12 $\frac{1}{4}$	11 $\frac{7}{8}$
Diameter of Eyes, in inches.....	1	1
Approximate Net Weight, per 100, in lbs.....	1,450	1,700
Approximate Weight Packed, per 100, in lbs....	1,900	2,300
Approximate Number in Barrel.....	12	6

Code Word	No.	List per 100
Moonbeam.	11938—Strain Insulator, two units for 22,000 Volts.....	\$330 00
Mooned.	11939—“ “ “ “ 22,000 “.....	400 00

*Ground return circuit with full line voltage between wire and ground.

Above Insulators can be furnished with any desired number of units.

The actual working voltage should be specified on all orders or inquiries.

O-B Hi-Tension Porcelain Insulators

Continued

Strain Insulator Data

ALL of our Porcelain Strain Insulators, excepting our Catalogue No. 9900, which is too large to be made successfully in one piece, are made from a single piece or pug of clay. This eliminates the glazed or cemented joint and provides solid porcelain between guy wire and strain pin. Figures 1 and 2 show standard methods of mounting single strain insulators.

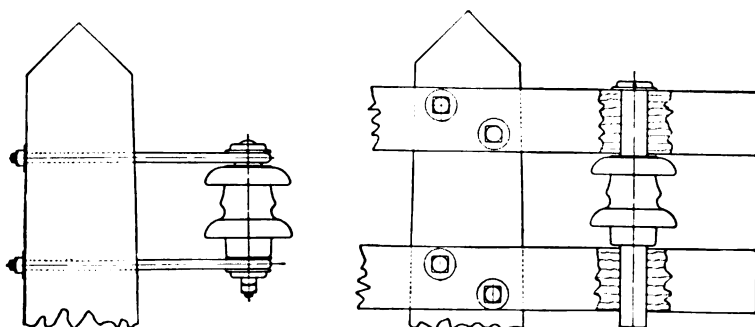


Figure 1

Figure 2

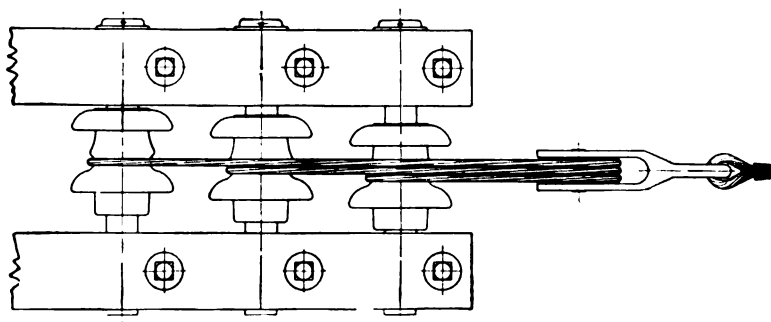


Figure 3

The ultimate breaking strain for a single strain insulator averages from 9,000 to 12,000 pounds (Laboratory Tests). We would, therefore, recommend 4,000 pounds as a safe working load for a single Porcelain Strain Insulator. This is a conservative value, but is one which we are very sure every one of our strain insulators will stand.

For loads heavier than 4,000 pounds we recommend that these Strain Insulators be put in multiple to sustain the load as shown in Fig. 3.

O-B Porcelain Link Strain Insulator

11,000 Volts



Front View



Rear View

USED for insulating spans or dead-ending feeder wires. Strand wire can easily be threaded as holes are practically straight.

It is provided with a ball-edge which increases its ruggedness.

Working Voltage.....	11,000
Test Voltage.....	40,000
Maximum Working Load in lbs.....	2,500
Ultimate Strength in lbs.....	10,000
Diameter of Insulator in inches.....	7 ³ / ₄
Diameter of Holes for Strand in inches.....	1 ¹ / ₈
Approximate Net Weight, per 100, in lbs.....	400
Approximate Weight Packed, per 100, in lbs.....	629
Approximate Number in Barrel.....	30

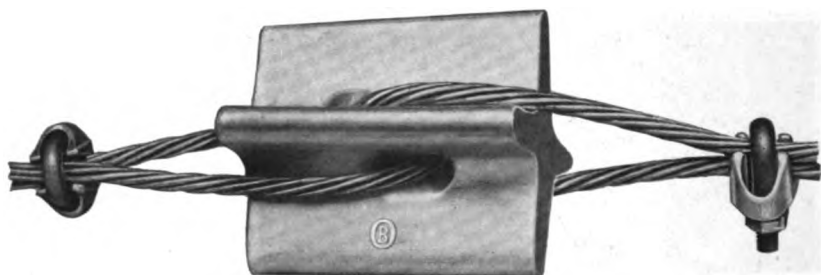
Code Word	No.	List per 100
<i>Mooney.</i>	11940—Link Strain Insulator for 11,000 volts.....	\$165 00

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

Patent Applied For

Type X—2,300-6,600 Volts



USED for insulating guy wires and dead-ending. Has long leakage path and is made of high tension porcelain having high mechanical strength.

Strands are interlocked so that they cannot become separated should insulator be broken.

Holes for strand are straight making installation easy.

Catalogue Numbers	11629	11630
Working Voltage.....	2,300	6,600
Diameter of Insulator, in inches.....	4 $\frac{3}{8}$	5 $\frac{3}{8}$
Height of Insulator, in inches.....	5	6 $\frac{1}{2}$
Diameter of Holes for Strand, in inches.....	$\frac{5}{8}$	$\frac{5}{8}$
Approximate Net Weight, per 100, in lbs.....	200	335
Approximate Weight packed, per 100, in lbs....	270	435
Approximate Number in Barrel.....	60	40

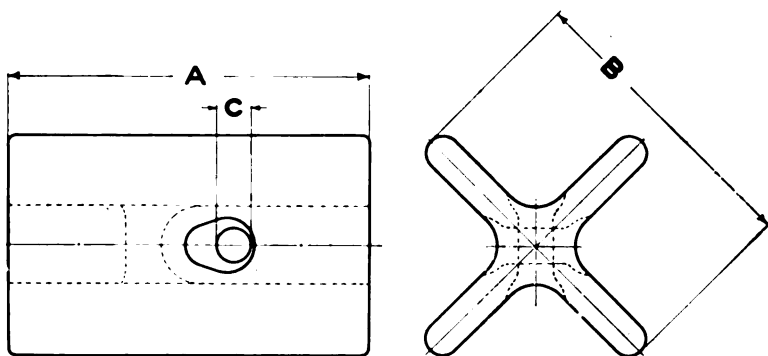
Code Word	No.	List per 100
<i>Moonfish.</i>	11629—Type X Strain Insulator for 2,300 Volts.....	\$ 66 00
<i>Moonrise.</i>	11630— " " " " 6,600 "	110 00

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

Patent Applied For

Type X—2,300-6,600 Volts



Nos. 11629-11630

Catalogue No.	Working Voltage	Dimensions in Inches			Weight per 100
		A	B	C	
11629	2300	5	4 $\frac{1}{2}$	$\frac{1}{2}$	200
11630	6600	6 $\frac{1}{2}$	5 $\frac{1}{2}$	$\frac{1}{2}$	335

See description and list on opposite page.

O-B Porcelain Strain Insulator

5000 Volts



No. 9997—One Piece

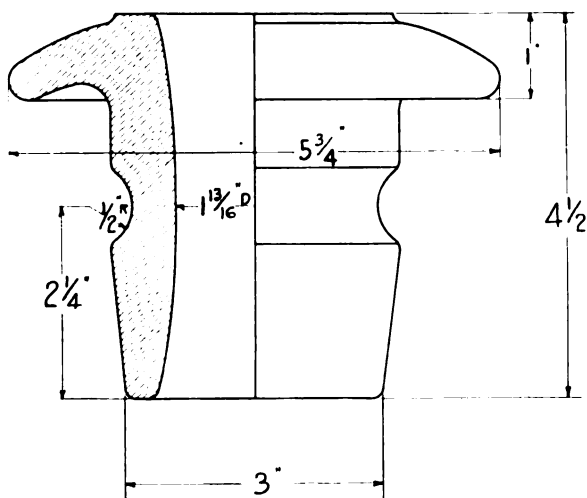
Working Voltage.....	5000
Test Voltage.....	30,000
Leakage Surface.....	1½ in.
Diameter of Insulator.....	5¼ "
Height of Insulator.....	4½ "
Diameter of wire groove.....	1 "
Minimum Diameter of pin hole.....	1½ "
Use Strain Pins Nos.....	9559 or 9562
Approximate Net Weight, per 100, in lbs.....	313
Approximate Weight packed, per 100, in lbs.....	367

Code Word	No.	List per 100
Fountain.	9997—Strain Insulator for Cable, for 5000 Volts.....	\$88 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

5,000 Volts



No. 9997

The diameter of pin hole given above is minimum. The maximum allowable value for this dimension is $1\frac{1}{4}$ inches.

See description and list on the opposite page.

O-B Porcelain Strain Insulator

10,000—20,000 Volts



Nos. 9898-10257—One Piece

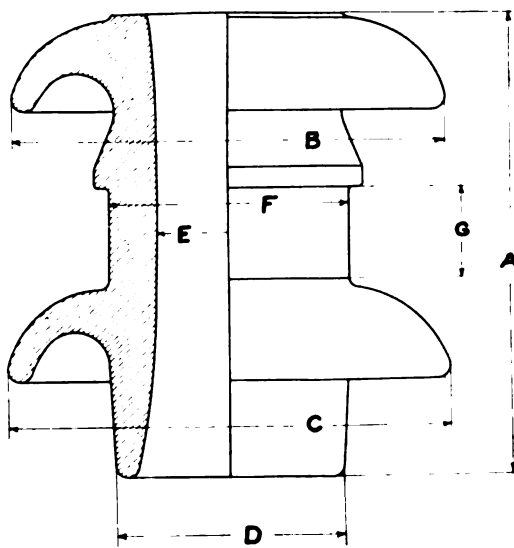
CATALOGUE NUMBERS	9898	10257
Working Voltage.....	10,000	20,000
Test Voltage.....	40,000	60,000
Leakage Surface.....	5½ in.	6¾ in.
Arcing Distance, wet.....	1½ "	2¼ "
Diameter of Insulator.....	5¾ "	7½ "
Height of Insulator.....	6 "	8¼ "
Minimum Diameter of pin hole.	1¾ "	2⅜ "
Approximate Net Weight, per 100, in lbs.	410	825
Approximate Weight packed, per 100, in lbs.	533	1115
Insulator is used in making up Catalogue Numbers	{ 10242 } { 10246 }	{ 10243 } { 10247 }

Code Word	No.	List per 100
Fourfold.	9898—Strain Insulator for 1-inch Metal Band, for 10,000 volts.....	\$165 00
Knobbed.	10257— " " " 1 " " " " 20,000 "	220 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

10,000-20,000 Volts



Nos. 9898-10257

Catalogue No.	A	B	C	D	*E	F	G
9898	6	5 $\frac{1}{8}$	5 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{1}{8}$	3 $\frac{1}{8}$	1 $\frac{1}{8}$
10257	8 $\frac{1}{2}$	7 $\frac{1}{2}$	7 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{1}{8}$	3 $\frac{1}{8}$	1 $\frac{1}{8}$

* Dimensions given under "E" are minimum. The maximum allowable values for these dimensions are $\frac{1}{8}$ inch above those given.

See description and list on the opposite page.

O-B Porcelain Strain Insulator

10,000—15,000—20,000 Volts



Nos. 9897-9899-9486, One Piece

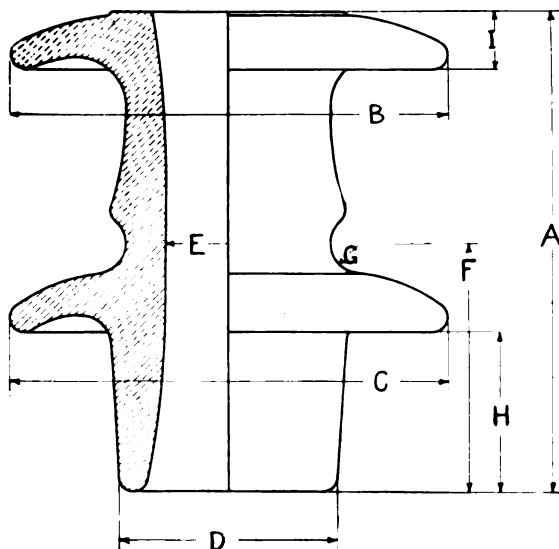
CATALOGUE NUMBERS	9897	9899	9486
Working Voltage.....	10,000	15,000	20,000
Test Voltage.....	40,000	50,000	60,000
Leakage Surface.....	5½ in.	6¼ in.	6¾ in.
Arcing Distance, wet.....	1½ "	1¾ "	2¼ "
Diameter of Insulator.....	5¾ "	7¼ "	7½ "
Height of Insulator.....	6 "	7 "	8¼ "
Diameter of wire groove.....	1 "	¾ "	1 "
Minimum Diameter of pin hole.....	1⅞ "	2¼ "	2⅜ "
Use Strain Pins Nos.....	{ 9559 } { 9562 }	{ 9561 } { 9564 }	{ 9561 } { 9564 }
Approximate Net Weight, per 100, in lbs.....	410	825	826
Approximate Weight packed, per 100, in lbs..	533	1137	1137

Code Word	No.	List per 100
<i>Forcate.</i>	9897—Strain Insulator for 10,000 volts.....	\$176 00
<i>Foxery.</i>	9899— " " " 15,000 "	253 00
<i>Framable.</i>	9486— " " " 20,000 "	275 00

The actual working voltage desired should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

10,000—15,000—20,000 Volts



No. 9897-9899-9486

Dimensions in Inches

Cat. No.	A	B	C	D	E*	F	G	H	I
9897	6	5 $\frac{3}{8}$	5 $\frac{1}{2}$	2 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$	$\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{4}$
9899	7	7	7 $\frac{1}{4}$	3 $\frac{1}{2}$	2 $\frac{3}{8}$	3 $\frac{1}{4}$	$\frac{3}{4}$	1 $\frac{1}{2}$	1 $\frac{3}{4}$
9486	8 $\frac{1}{4}$	7 $\frac{1}{2}$	7 $\frac{1}{2}$	3 $\frac{1}{2}$	2 $\frac{3}{8}$	4 $\frac{1}{4}$	$\frac{1}{2}$	2 $\frac{1}{4}$	1

* Dimensions given under "E" are minimum. The maximum allowable values for these dimensions are $\frac{1}{8}$ inch above those given.

See description and list on the opposite page.

O-B Porcelain Strain Insulator

35,000 Volts



No. 9900

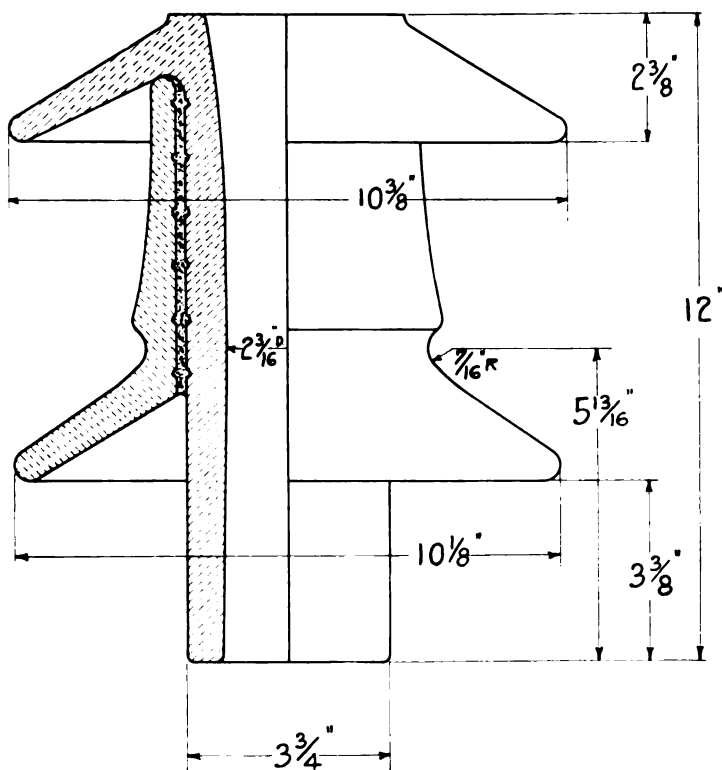
Working Voltage.....	35,000
Test Voltage.....	90,000
Leakage Surface.....	10 inches
Arcing Distance, wet.....	3 $\frac{1}{4}$ "
Diameter of Insulator.....	10 $\frac{3}{8}$ "
Height of Insulator.....	12 "
Diameter of wire groove.....	$\frac{7}{8}$ "
Minimum Diameter of pin hole.....	2 $\frac{1}{8}$ "
Use Strain Pins Nos.....	9934 or 9935
Approximate Net Weight, per 100, in lbs.....	2100
Approximate Weight packed, per 100, in lbs.....	3535

Code Word	No.	List per 100
Frangent.	9900—Strain Insulator for 35,000 volts.....	\$550 00

The actual working voltage desired should be specified on all orders or inquiries

O-B Porcelain Strain Insulator

35,000 Volts



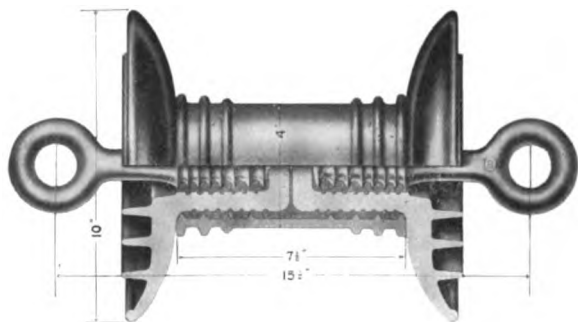
No. 9900

The diameter of pin hole given above is minimum. Maximum allowable value for this dimension is $2\frac{1}{4}$ inches.

See description and list on the opposite page.

O-B Porcelain Strain Insulator

30,000 Volts



No. 10749

All castings are malleable iron, galvanized.

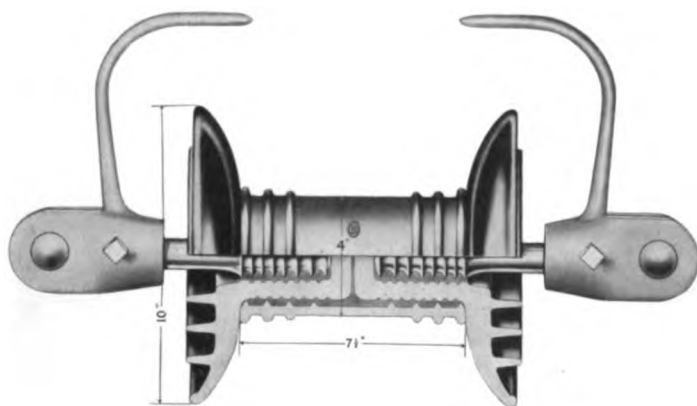
Working Voltage (Catenary Service)*.....	17,000
Working Voltage (Transmission Service).....	30,000
Test Voltage.....	110,000
Maximum Working Load in lbs.....	5,000
Ultimate Strength in lbs.....	20,000
Diameter of Eyes in inches.....	1 1/2
Approximate Net Weight, per 100, in lbs.....	2,825
Approximate Weight Packed, per 100, in lbs.....	3,535
Approximate Number in crate.....	4

Code Word	No.	List Each
Hiatus.	10749—Strain Insulator for 30,000 Volts.....	\$ 8 80

*Ground return with full line voltage between wire and ground.
The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

30,000 Volts



No. 11689

END castings are provided with discharge horns which are desirable under certain conditions, as they cut down the time lag for excessive surges and increase the factor of safety of the Insulator.

All castings are malleable iron, galvanized.

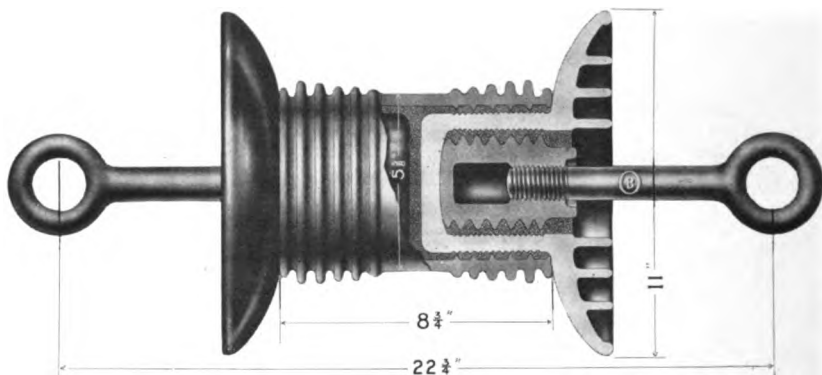
Working Voltage (Catenary Service)*.....	17,000
Working Voltage (Transmission Service).....	30,000
Test Voltage.....	110,000
Maximum Working Load in lbs.....	5,000
Ultimate Strength in lbs.....	20,000
Opening in Clevis, in inches.....	1
Diameter of Clevis Bolt, in inches.....	$\frac{3}{4}$
Distance between centers of Clevis Bolt, in inches.....	19 $\frac{1}{2}$
Approximate Net Weight, per 100, in lbs.....	4,100
Approximate Weight Packed, per 100, in lbs.....	5,000
Approximate Number in crate.....	4

Code Word	No.	List Each
<i>Moonseed.</i>	11689—Strain Insulator for 30,000 Volts.....	\$13 75

*Ground return circuit with full line voltage between wire and ground.
The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

30,000 Volts



No. 10750

All castings are malleable iron, galvanized.

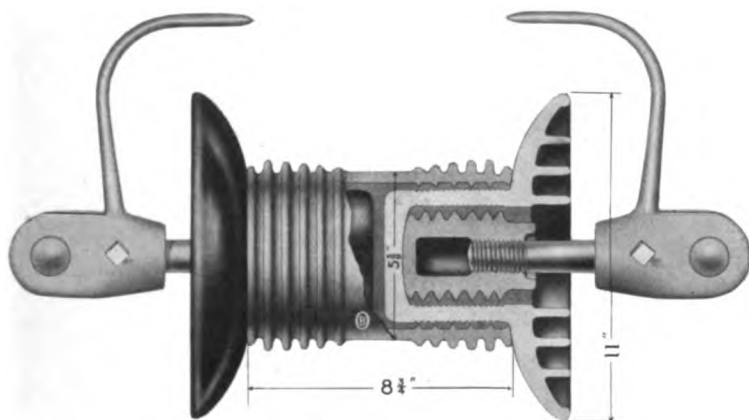
Working Voltage (Catenary Service)*.....	17,000
Working Voltage (Transmission Service).....	30,000
Test Voltage.....	110,000
Maximum Working Load in lbs.....	10,000
Ultimate Strength in lbs.....	35,000
Diameter of Eyes, in inches.....	1 1/4
Approximate Net Weight, per 100, in lbs.....	6,060
Approximate Weight Packed, per 100, in lbs.....	7,575
Approximate Number in crate.....	2

Code Word	No.	List Each
<i>Hibiscus.</i>	10750—Strain Insulator for 30,000 Volts.....	\$18 70

*Ground return circuit with full line voltage between wire and ground.
The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Strain Insulator

30,000 Volts



No. 11941

END castings are provided with discharge horns which are desirable under certain conditions as they cut down the time lag for excessive surges and increase the factor of safety of the Insulator.

All castings are malleable iron, galvanized.

Working Voltage (Catenary Service)*.....	17,000
Working Voltage (Transmission Service).....	30,000
Test Voltage.....	110,000
Maximum Working Load in lbs.....	10,000
Ultimate Strength in lbs.....	35,000
Opening in Clevis, in inches.....	1
Diameter of Clevis Bolt, in inches.....	$\frac{3}{4}$
Distance between centers of Clevis Bolts, in inches.....	20
Approximate Net Weight, per 100, in lbs.....	7,335
Approximate Weight Packed, per 100, in lbs.....	9,040
Approximate Number in crate.....	2

Code Word
Moonwort.

No. 11941—Strain Insulator for 30,000 Volts.....

List Each
\$24 20

*Ground return circuit with full line voltage between wire and ground.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Sectional Insulator

Post Type—Patented

133,000 Volts—Indoor Service



Code Word
Hagdon.

No.
10564—Sectional Insulator, Post Type

List Each
\$38 50

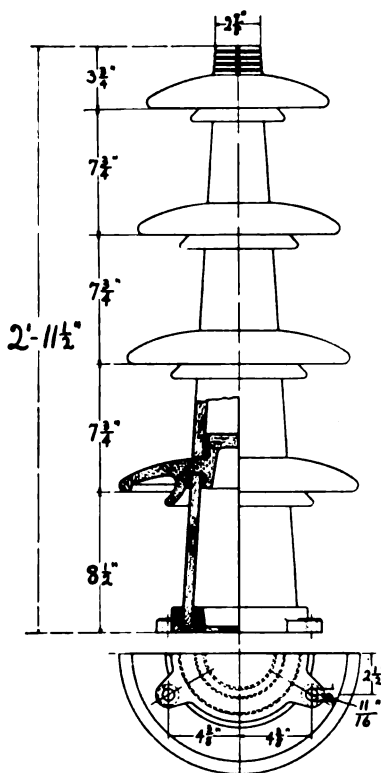
The actual working voltage should be specified on all orders or inquiries.
See description on opposite page.

O-B Porcelain Sectional Insulator

Post Type—Patented

133,000 Volts—Indoor Service

Continued



No. 10564

USED for mounting high tension switches, other power house equipment, and also for outside service.

We can also furnish an Insulator similar to the above but designed for use in an inverted position.

Both styles can be furnished in sizes to meet all requirements.

Surface leakage is 74 inches; net weight each, 75 lbs.; packed weight each, 135 lbs. Glaze, slate colored.

The actual working voltage should be specified on all orders or inquiries.

See opposite page for listing.

O-B Porcelain Pillar Insulators

Type B, Form 1



No. 10660

THESE Insulators are intended for insulating high voltage bus bars, switches, etc. They are suitable for mounting supported from below or suspended from above or they may be mounted horizontally by bolting to a wall. The circular flange on cap and base castings is 6 inches in diameter and has four $\frac{9}{16}$ -inch bolt holes spaced 90 degrees apart on a 5-inch circle. In assembling, the bolt holes in the cap and base are kept in the same relative position. The Insulators are assembled before shipment and packed one in a crate. All castings are malleable iron, galvanized.

Code Word	No.	Number of Units	Working Voltage		Diameter of Unit, Inches	Height overall, Inches	Net Weight, each, lbs.	List Each
			Outdoor	Indoor				
<i>Knurly.</i>	11366	3	60,000	75,000	10	20 $\frac{1}{4}$	40	\$12 65
<i>Hodiern.</i>	10660	4	75,000	90,000	10	25 $\frac{1}{8}$	50	14 85
<i>Hodman.</i>	10661	5	90,000	110,000	10	30 $\frac{1}{4}$	60	17 60
<i>Holcad.</i>	10662	6	110,000	135,000	10	36 $\frac{1}{4}$	70	21 25
<i>Kummel.</i>	11367	7	135,000	150,000	10	41 $\frac{1}{4}$	80	25 30

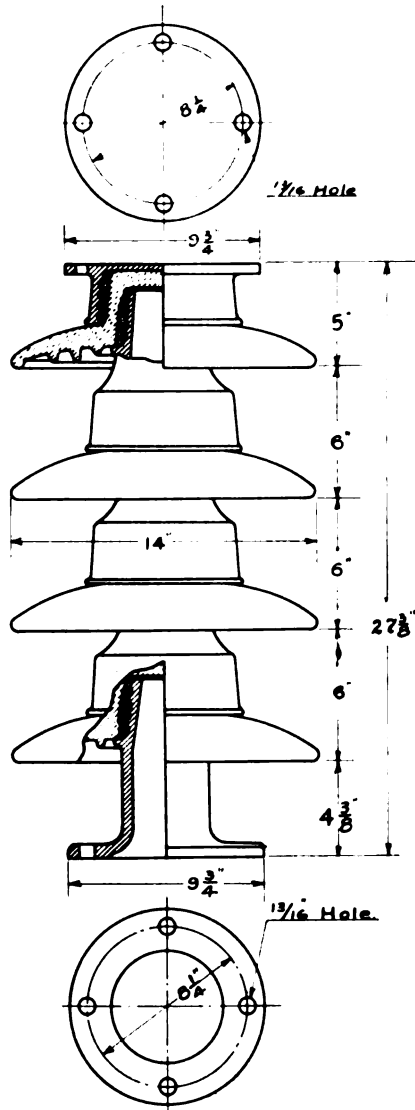
Each section is tested at 85,000 volts before being assembled.

The cap and base castings of all Insulators listed on pages 340, 346 and 348 are interchangeable.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Pillar Insulator

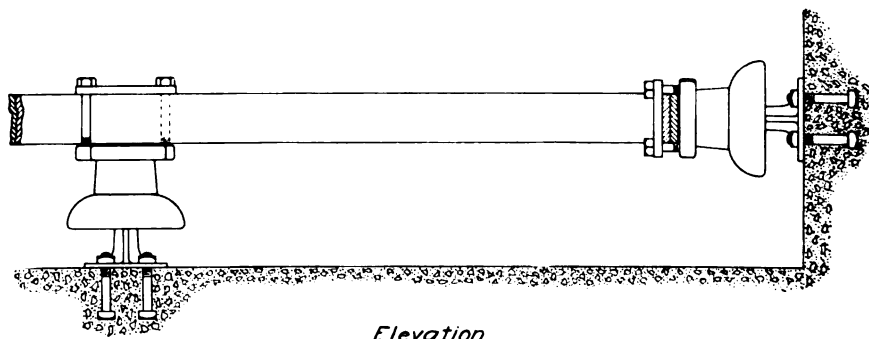
Type B, Form 2



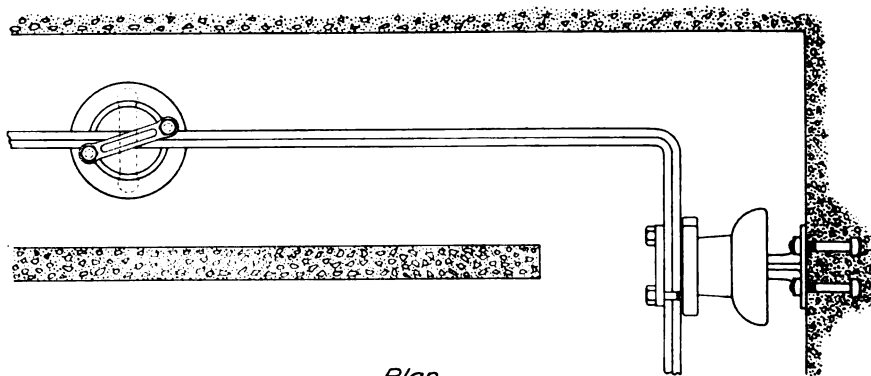
No. 10664

See description and list on the opposite page.

Low Voltage Bus Bar Installation



Elevation



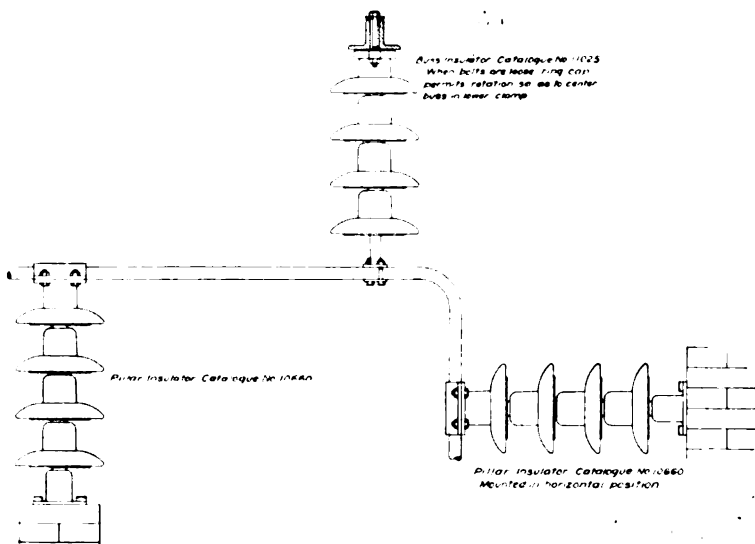
Plan

O-B Bus Bar Insulator, No. 10948 is used

Bus bar is held tightly against rigid cap of insulator, which affords ample strength to resist magnetic pull in case of short circuit with large bus bars.

Revolving ring permits bus bar to be attached to insulator in any desired position. Clamping device accommodates a wide range of sizes of both rectangular and circular bus bars.

High Voltage Bus Bar Installation

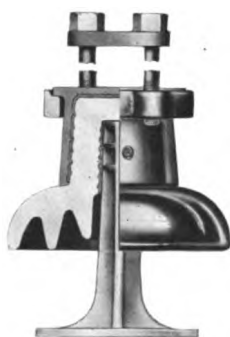


Flanges of cap and base castings of insulator No. 10660 have same drilling, which makes it possible to mount the insulator in any desired position.

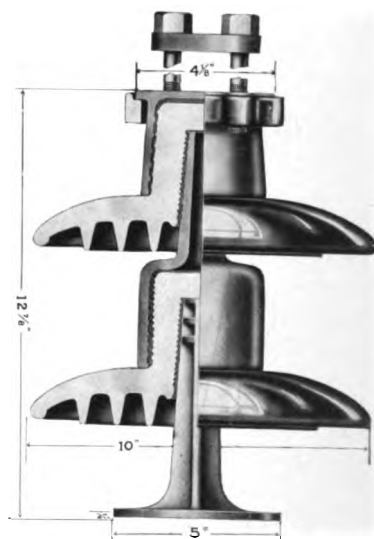
Insulator No. 10660 may be furnished with Revolving Ring described on preceding page, if desired.

O-B Porcelain Bus Bar Insulators

Type A



No. 10948



No. 10951

THE clamp which holds the bus bar in place is attached to a ring so that it can be rotated, making a secure clamp for a bar of any width not exceeding 4 inches. It will clamp either round or rectangular bars and with the bolts as regularly furnished, will take any bar not over 3 inches high. Higher bars may be used by employing longer clamping bolts.

The circular base is arranged with four $\frac{3}{4}$ -inch bolt holes, spaced 90 degrees apart on a $3\frac{9}{16}$ -inch circle. All castings are malleable iron, galvanized, except top strap, which is bronze.

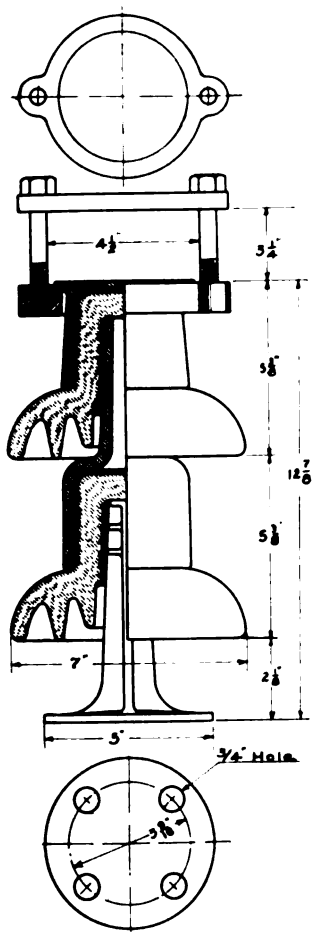
Code Word	No.	Number of Units	Indoor Working Voltage	Test Voltage per Unit Unassembled	Diameter of Unit Inches	Height Overall, Inches	Net Weight, Each, lbs.	List Each
<i>Intercur.</i>	10948	1	13,000	75,000	7	7 $\frac{1}{2}$	14	\$4 00
<i>Interdash.</i>	10949	1	17,000	85,000	10	7 $\frac{1}{2}$	16	5 00
<i>Interdome.</i>	10950	2	33,000	75,000	7	12 $\frac{7}{8}$	22	6 20
<i>Interesse.</i>	10951	2	44,000	85,000	10	12 $\frac{7}{8}$	27	8 40

The cap and base castings of all Insulators listed on pages 340, 346 and 348 are interchangeable.

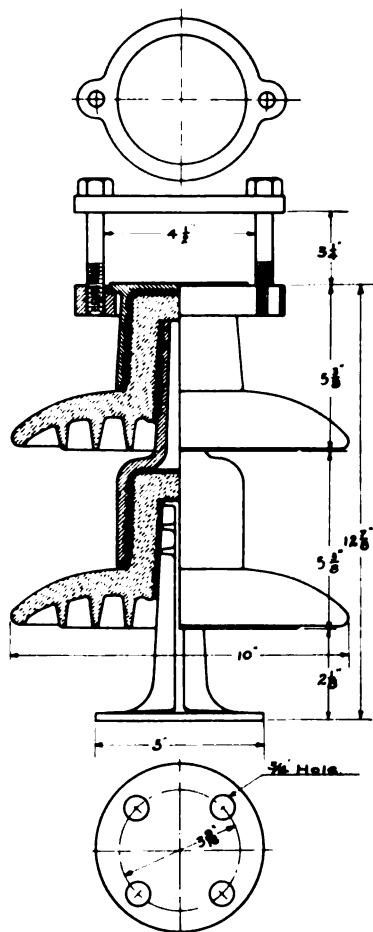
The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Bus Bar Insulators

Type A



No. 10950



No. 10951

See diagrams of Bus Bar connections on pages 344 and 345.

See description and list on the opposite page.

O-B Porcelain Bus Bar Insulators

Type B



THESE Insulators are intended for suspending bus bars, the adjustable ring cap being attached to the overhead structure by two bolts passing through the ring casting. This allows the Insulator to be rotated about its vertical axis before the bolts are finally tightened so that the bus bar clamp will hold the bus bar centrally. The bolts in the cap casting are $\frac{1}{8}$ x5 inches, but the length can be varied according to requirements.

Bronze bus bar clamp, with $\frac{3}{8}$ x2 $\frac{1}{2}$ -inch bolts as ordinarily furnished, will grip a pipe of 1 $\frac{3}{4}$ inches diameter or a flat bus bar 1 $\frac{3}{4}$ inches wide and 1 $\frac{3}{8}$ inches high; higher bars may be used by substituting longer bolts. All other castings are malleable iron, galvanized.

Code Word	No.	No. of Units	Indoor Working Voltage	Diameter of Unit, Inches	Height Overall, Inches	Net Weight, Each, lbs.	List Each
<i>Licking.</i>	11368	3	75,000	10	19 $\frac{1}{8}$	43	\$12 70
<i>Interhyal.</i>	11025	4	90,000	10	24 $\frac{1}{8}$	57	14 90
<i>Lictor.</i>	11369	5	110,000	10	29 $\frac{1}{8}$	71	17 60
<i>Liefsome.</i>	11370	6	135,000	10	35 $\frac{1}{8}$	85	21 30
<i>Lifeboat.</i>	11371	7	150,000	10	40 $\frac{1}{8}$	99	25 30

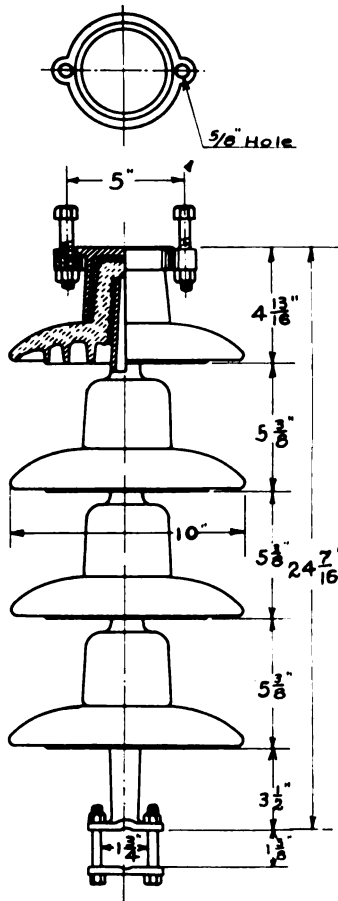
Each section of above Insulators is tested at 85,000 volts before being assembled.

The cap and base castings of all Insulators listed on pages 340, 346 and 348 are interchangeable.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Bus Bar Insulators

Type B

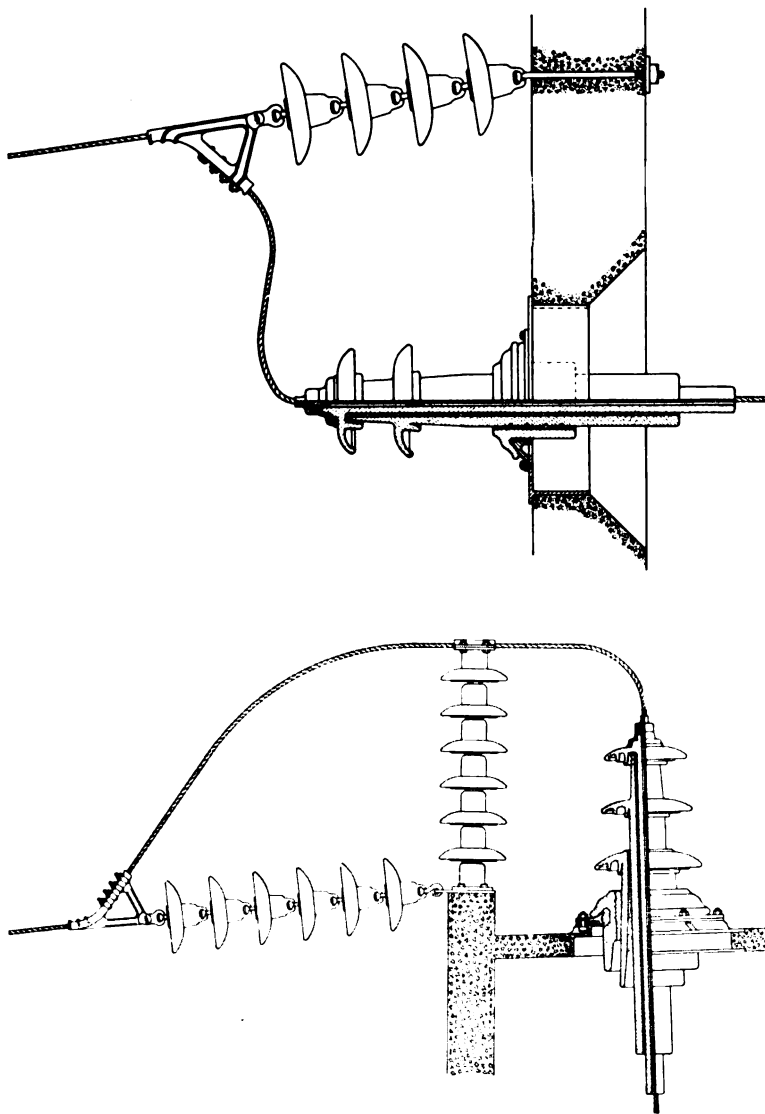


No. 11025

See diagrams of Bus Bar connections on pages 344 and 345.

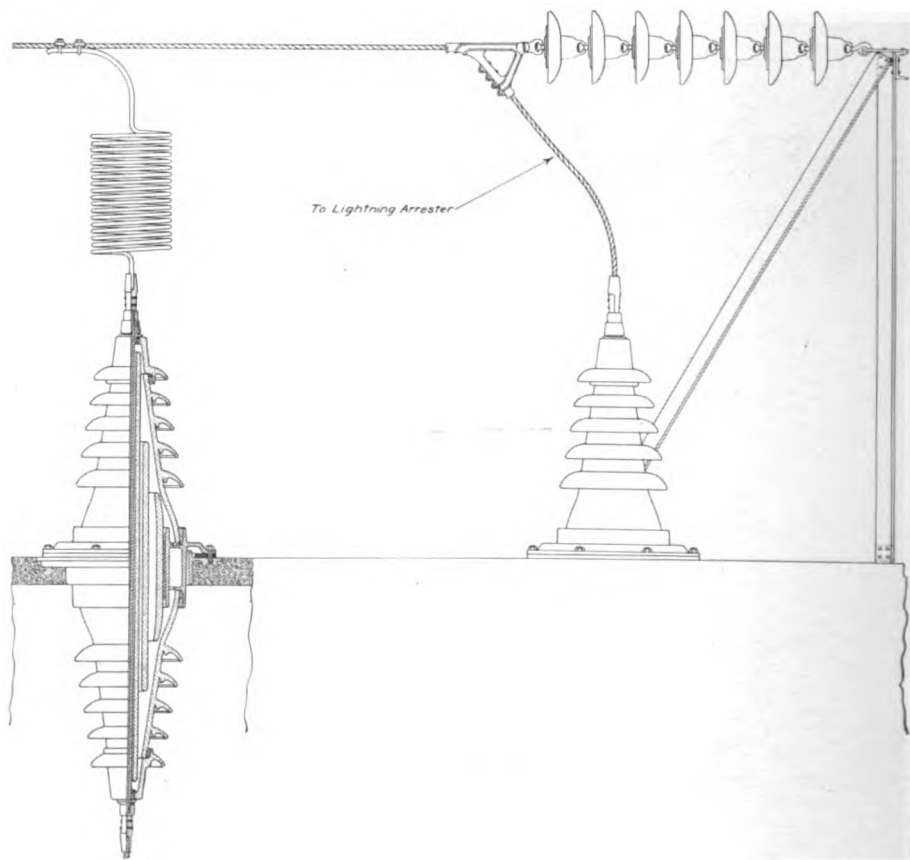
See description and list on the opposite page.

Wall and Roof Entrance Installations



A tarred felt gasket inserted between the flange casting of the bushing and the sister flange cemented in the roof makes a water-tight joint.

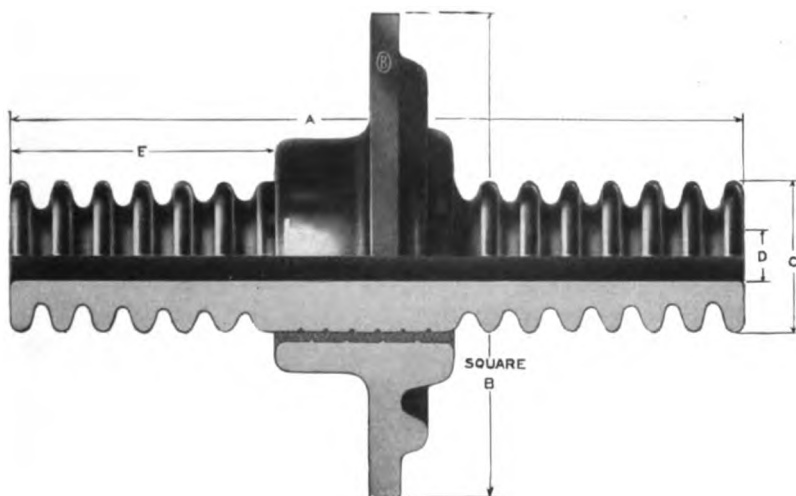
Roof Entrance Installation



A tarred felt gasket between the flange casting of bushing and casting cemented in roof makes a water-tight joint.

O-B Porcelain Wall Insulator

Type A. Form 1, 20,000—60,000 Volts



THIS Wall Insulator consists of a square porcelain flange cemented on a heavy corrugated porcelain tube, and is well adapted to be cemented into the wall of the building. It is exceptionally strong, all of the corrugations being heavy enough to resist a considerable blow without fracture.

In order to make the installation of these Wall Insulators complete, a small shed or housing should be built over each insulator where it is cemented into the wall to afford additional protection and help maintain dry surfaces in wet weather.

Code Word	No.	Working Voltage	Leakage Surface	Dimensions in Inches					Net Weight Each, lbs.	List Each
				A	B	C	D	E		
<i>Fraught.</i>	10045	20,000	19½ in.	18	12	4½	1½	6½	32	\$13 90
<i>Fraying.</i>	10046	40,000	24½ "	22	12	4½	1½	8½	36	19 80
<i>Freckle.</i>	10047	60,000	26½ "	24	12	4½	1½	9½	38	21 80

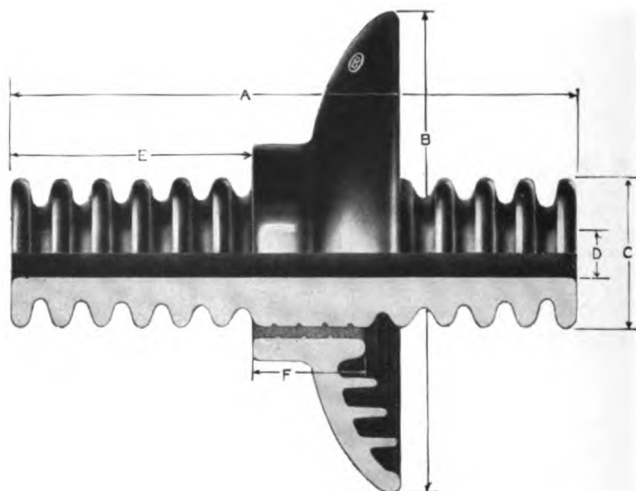
See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall Insulator

Patented

Type B, Form 1, 30,000—60,000 Volts



THIS Insulator consists of a corrugated porcelain disc cemented on a heavy corrugated porcelain tube, and differs from the Type "A," Form 1, Wall Insulator listed on the preceding page, in that the outer flange is circular instead of square. These insulators are equipped with shorter corrugated tubes than are used on the Type "A," Form 1, Insulators, because the circular flange in this case has more leakage surface than the square flange. These insulators may be cemented in the wall or in a small housing built on the side of the wall. In any case the corrugated surface of flange should face towards the outside.

Code Word	No.	Working Voltage	Leakage Surface	Dimensions in Inches						Net Wt. each. lbs.	List Each
				A	B	C	D	E	F		
<i>Freedman.</i>	10048	30,000	19 in.	14	12	4½	1½	5	2½	22	\$ 9 90
<i>Freedom.</i>	10049	50,000	21 "	14	14	4½	1½	5	2½	24	10 90
<i>Freezer.</i>	10050	60,000	30 "	20	14	4½	1½	7	2½	29	17 90

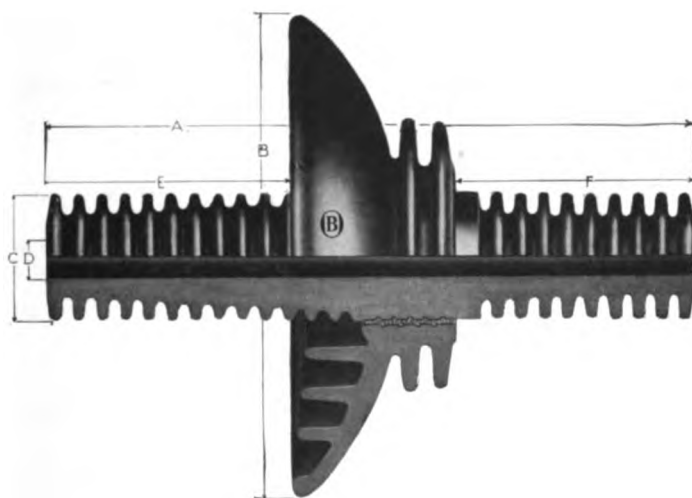
See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall Insulator

Patented

Type B, Form 3, 70,000 Volts



THIS Insulator consists of a corrugated porcelain disc cemented on a heavy corrugated porcelain tube, and is very similar to the Type "B," Form 1, Wall Insulator listed on the preceding page.

This Insulator may be cemented in the wall or in a small housing built on the side of the wall. In any case the corrugated surface of flange should face towards the outside.

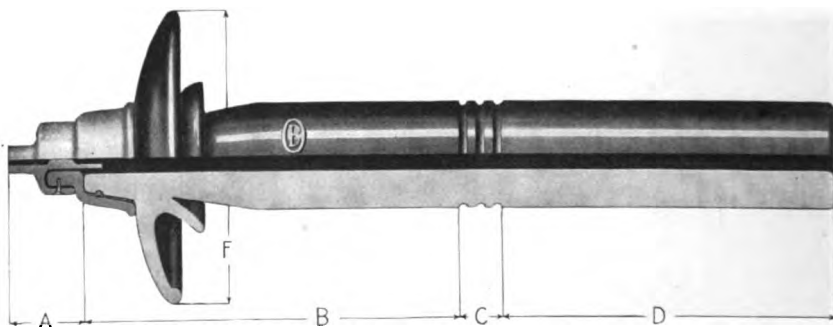
Code Word	No.	Working Voltage	Leakage Surface	Dimensions in Inches						Net Wt. each, lbs.	List Each
				A	B	C	D	E	F		
<i>Frenetic.</i>	10563	70,000	44 in.	24	18	4½	1½	9½	8½	65	\$31 70

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall or Roof Insulator

11,000 Volts



No. 10649

THIS Insulator can be used in either a horizontal or vertical position when exposed to the weather and with the rated voltage applied. Maximum efficiency is obtained by combining low weight and long striking distance.

Insulator No. 10649 is equipped with an iron cap and a bronze terminal as shown in the illustration. No. 10650 is furnished without either cap or terminal.

Holes drilled in top and bottom of bronze terminal are $\frac{1}{2}$ inch in diameter; both are tinned for soldering.

Outside diameter tube, 4 inches; inside diameter, $1\frac{1}{4}$ inches.

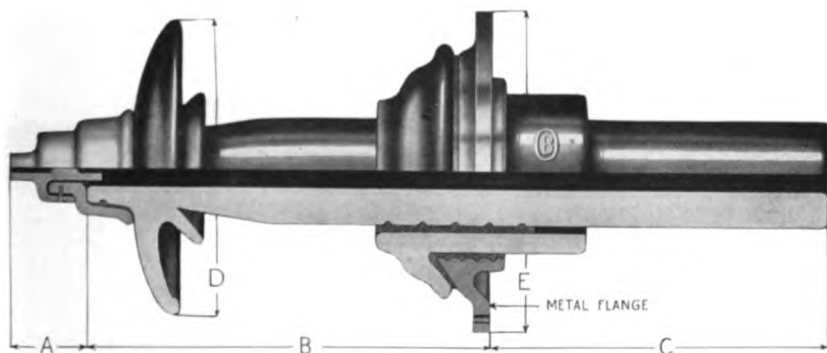
Code Word	No.	Working Voltage	Dimensions in Inches					Net Weight Each, lbs.	List Each
			A	B	C	D	F		
<i>Hickway. Hiding.</i>	10649	11,000	$2\frac{1}{2}$	$14\frac{1}{2}$	$1\frac{1}{2}$	$12\frac{1}{2}$	11	38	\$24 20
	10650	11,000	...	$14\frac{1}{2}$	$1\frac{1}{2}$	$12\frac{1}{2}$	11	32	19 80

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall or Roof Insulator

25,000 Volts



No. 10651

THIS Insulator is designed to be exposed to the weather in either a horizontal or vertical position.

The metal flange has four $\frac{7}{8}$ -inch holes spaced 90° apart on a circle of $10\frac{3}{4}$ inches diameter.

Insulator No. 10651 is equipped with the iron cap and bronze terminal as shown in the illustration; No. 10652 is furnished without either cap or terminal.

Iron flanges which are intended to be built into wall or roof can be furnished for use with these insulators.

Holes drilled in top and bottom of bronze terminal are $\frac{1}{2}$ inch in diameter; both are tinned for soldering.

Diameter of hole through tube, $1\frac{1}{4}$ inches.

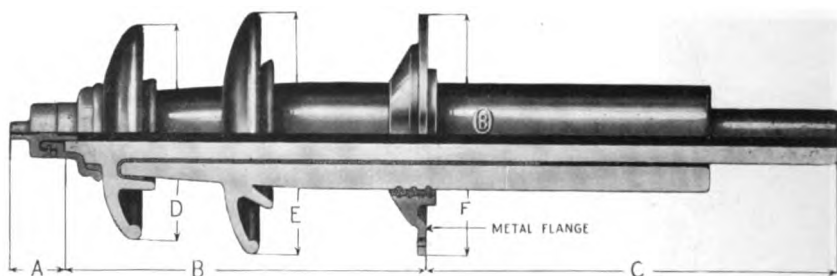
Code Word	No.	Working Voltage	Dimensions in Inches					Net Weight Each, lbs.	List Each
			A	B	C	D	E		
<i>Hilarity.</i>	10651	25,000	$2\frac{1}{8}$	$15\frac{1}{4}$	$12\frac{1}{4}$	11	12	58	\$33 00
<i>Hilltop.</i>	10652	25,000	.....	$15\frac{1}{4}$	$12\frac{1}{4}$	11	12	46	28 60

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall or Roof Insulator

40,000 Volts



No. 10653

THIS Insulator is made with two heads to give a long wet arcing distance, the factor of safety being sufficient to permit the use of the Insulator in either a horizontal or vertical position.

The metal flange which is intended to be bolted directly to the wall or roof has four $\frac{7}{16}$ -inch holes spaced 90° apart on a 10 $\frac{3}{4}$ -inch circle.

Insulator No. 10653 is equipped with an iron cap and a bronze terminal as shown in the illustration; No. 10654 is furnished without either cap or terminal.

Iron flanges which are intended to be built into wall or roof can be furnished for use with these Insulators.

Holes drilled in top and bottom of bronze terminal are $\frac{1}{2}$ inch in diameter; both are tinned for soldering.

Diameter of hole through inner tube, 1 inch.

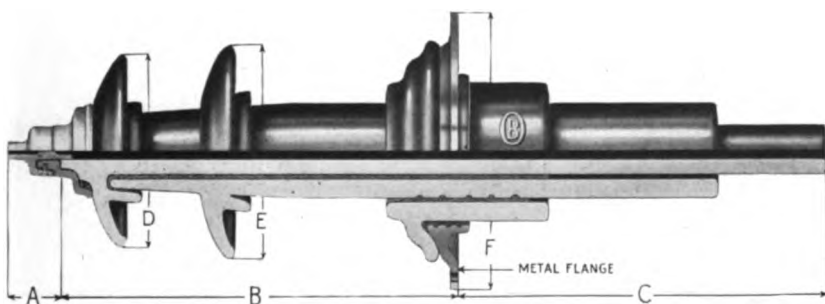
Code Word	No.	Working Voltage	Dimensions in Inches						Net Weight Each, lbs.	List Each
			A	B	C	D	E	F		
<i>Hinder.</i>	10653	40,000	2 $\frac{1}{4}$	18	20	11	12	12	90	\$53 90
<i>Histronic.</i>	10654	40,000	...	18	20	11	12	12	80	49 50

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall or Roof Insulator

50,000 to 60,000 Volts



Nos. 10655 and 10657

THIS Insulator may be operated in either a horizontal or vertical position when exposed to the weather.

The metal flange for fastening the Insulator to wall or roof has four $\frac{3}{16}$ -inch holes spaced 90° apart on a circle of $13\frac{3}{4}$ inches diameter

Insulators Nos. 10655 and 10657 are equipped with an iron cap and a bronze terminal as shown; Nos. 10656 and 10658 are furnished without either cap or terminal.

Iron flanges which are intended to be built into wall or roof can be furnished for use with these Insulators.

Holes drilled in top and bottom of bronze terminal are $\frac{1}{2}$ inch in diameter; both are tinned for soldering.

Diameter of hole through inner tube, 1 inch.

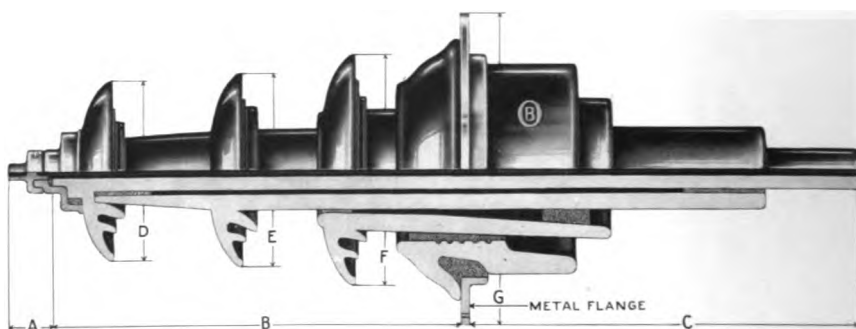
Code Word	No.	Working Voltage	Dimensions in Inches						Net Weight Each, lbs.	List Each
			A	B	C	D	E	F		
<i>Histrion.</i>	10655	50,000	2 $\frac{1}{4}$	18	20	11	12	15	135	\$66 00
<i>Hüter.</i>	10656	50,000	...	18	20	11	12	15	115	61 60
<i>Hobblers.</i>	10657	60,000	2 $\frac{1}{4}$	22	20	11	12	15	145	72 60
<i>Hobnail.</i>	10658	60,000	...	22	20	11	12	15	120	68 20

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall or Roof Insulator

80,000 Volts



No. 10981

THIS Insulator may be exposed to the weather in either a horizontal or vertical position, but in ordering, it is necessary that the kind of service should be specified since, when the Insulator is used as a Roof Entrance, the cement between the outer porcelain cylinders is filled in at the top to eliminate water pockets, while, for Wall Entrance service, it is left as shown in the cut in order to increase the leakage surface.

The metal flange for fastening the Insulator to wall or roof has six $\frac{5}{8}$ -inch holes spaced 60 degrees apart on a circle $19\frac{3}{4}$ inches in diameter.

Insulator No. 10981 is equipped with an iron cap and bronze terminal as shown; No. 10982 is furnished without either cap or terminal.

Iron flanges which are intended to be built into wall or roof can be furnished for use with these Insulators.

Holes drilled in top and bottom of bronze terminal are $\frac{1}{2}$ inch in diameter; both are tinned for soldering.

Diameter of holes through inner tube, 1 inch.

Code Word	No.	Working Voltage	Dimensions in Inches							Net Weight Each, lbs.	List Each
			A	B	C	D	E	F	G		
<i>Inracinate.</i>	10981	80,000	21½	27½	26	12	13	15½	21	255	\$148 50
<i>Insulatory.</i>	10982	80,000	...	27½	26	12	13	15½	21	230	144 10

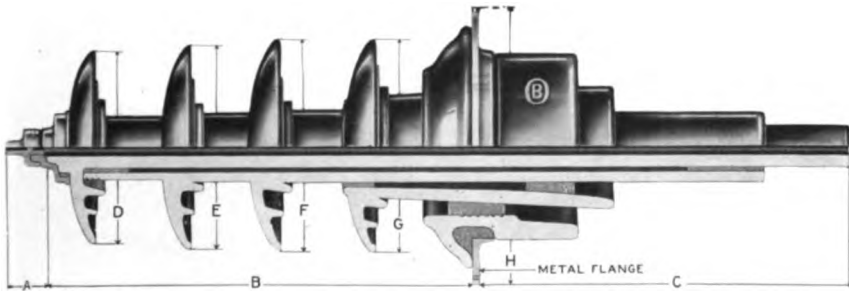
Note: Orders must specify whether Insulators are to be used in horizontal or vertical position.

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall or Roof Insulator

110,000 Volts



No. 10983

THIS Insulator may be exposed to the weather in either a horizontal or vertical position, but in ordering it is necessary that the kind of service should be specified since, when the Insulator is used as a Roof Entrance the cement between the outer porcelain cylinders is filled in at the top to eliminate water pockets, while, for Wall Entrance service, it is left as shown in the cut in order to increase the leakage surface.

The metal flange for fastening the Insulator to wall or roof has six $\frac{5}{8}$ -inch holes spaced 60 degrees apart on a circle of $19\frac{3}{4}$ inches in diameter.

Insulator No. 10983 is equipped with an iron cap and bronze terminal as shown; No. 10984 is furnished without either cap or terminal.

Iron flanges which are intended to be built into wall or roof can be furnished for use with these Insulators.

Holes drilled in top and bottom of bronze terminal are $\frac{1}{2}$ inch in diameter; both are tinned for soldering.

Diameter of hole through inner tube, 1 inch.

Code Word	No.	Working Voltage	Dimensions in Inches								Net Weight Each, lbs.	List Each
			A	B	C	D	E	F	G	H		
<i>Insanable.</i>	10983	110,000	$21\frac{1}{2}$	32	28	$14\frac{1}{2}$	$15\frac{1}{4}$	16	16	21	294	\$195 80
<i>Insaniate.</i>	10984	110,000	...	32	28	$14\frac{1}{2}$	$15\frac{1}{4}$	16	16	21	264	191 40

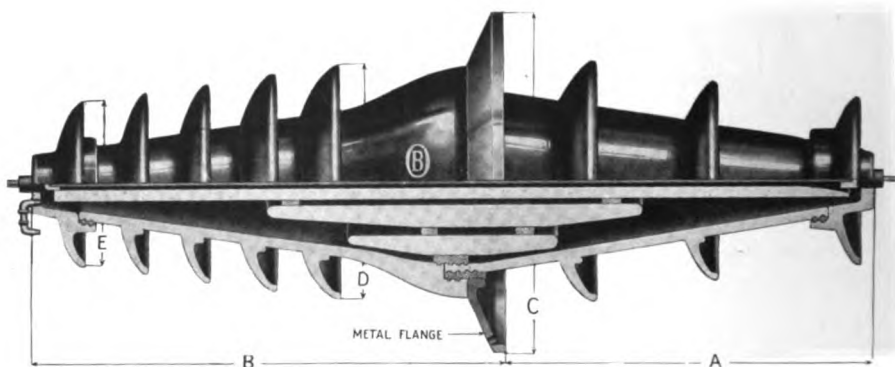
Note: Orders must specify whether Insulators are to be used in horizontal or vertical position.

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Roof Insulator

110,000 Volts



No. 10659

DESIGNED and built to be operated when exposed to the weather in vertical position. Insulators must be filled with transformer oil, or insulating compound, an attachment being provided for that purpose at the upper end.

The Insulator is provided with removable $\frac{5}{8}$ -inch brass studs which fit into brass terminal castings cemented in the ends of the Insulator and connected together by a 4-0 capacity copper cable.

It is provided with a metal flange which may be cemented directly into the roof, or bolted to an iron flange that is built into roof. These flanges can be furnished on request.

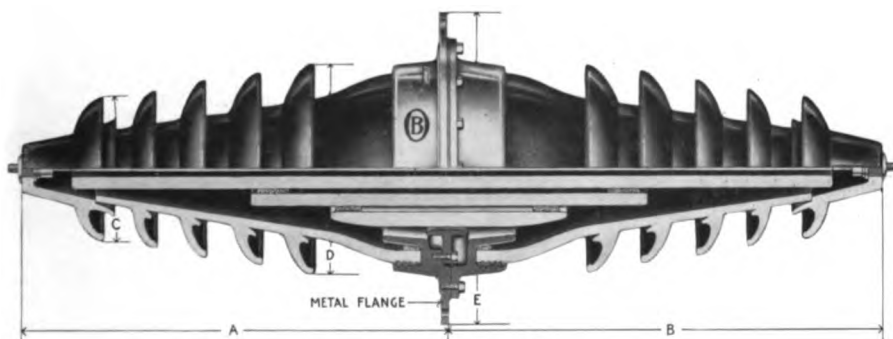
Code Word	No.	Working Voltage	Dimensions in Inches					Net Weight Each, lbs.	List Each
			A	B	C	D	E		
<i>Hockey.</i>	10659	110,000	23 $\frac{1}{2}$	33	22	16	11	350	\$187 00

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall Insulator

120,000 Volts



THIS Insulator may be exposed to the weather in a horizontal position.

Metal flange for mounting Insulator on wall has 6 holes, $\frac{3}{8}$ inch in diameter, equally spaced on a $22\frac{1}{2}$ -inch circle.

Both ends of Insulator are provided with $\frac{3}{4}$ -inch removable studs to which may be attached suitable sockets for terminal connections.

Connection through the Insulator is made by a 4/0 copper cable.

Insulator must be filled with transformer oil or insulating compound, an attachment being provided for that purpose on the metal flange.

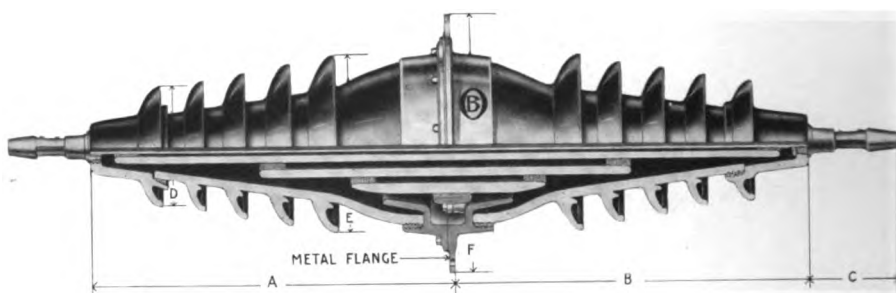
Code Word	No.	Working Voltage	Dimensions in Inches					Net Weight Each, Lbs.	List Each
			A	B	C	D	E		
<i>Mooring.</i>	11908	120,000	32 $\frac{1}{2}$	32 $\frac{1}{2}$	11	16	24	480	\$275 00

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Roof Insulator

120,000 Volts



THIS Insulator may be exposed to the weather in a vertical position. Metal flange for mounting insulator in roof has 6 holes, $\frac{5}{8}$ inch in diameter, equally spaced on a $22\frac{1}{2}$ -inch circle.

Both ends of Insulator are provided with removable bronze terminals having holes $1\frac{1}{8}$ inches in diameter, $2\frac{1}{4}$ inches deep; tinned for soldering.

Connection through the Insulator is made by seamless brass tubing.

Insulator must be filled by pouring transformer oil or insulating compound through the brass tubing.

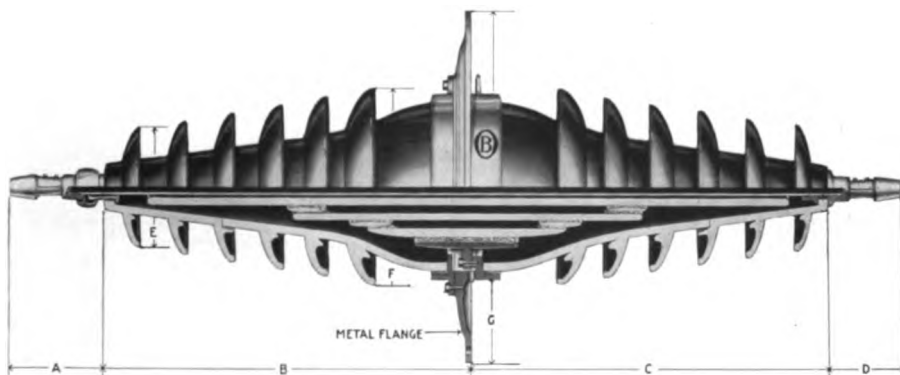
Code Word	No.	Working Voltage	Dimensions in Inches						Net Weight Each, Lbs.	List Each
			A	B	C	D	E	F		
<i>Moorland.</i>	11910	120,000	$32\frac{1}{4}$	$32\frac{1}{4}$	$7\frac{1}{4}$	11	16	24	525	\$352 00

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Wall Insulator

150,000 Volts



THIS Insulator may be exposed to the weather in a horizontal position.

Metal flange for mounting Insulator on wall has 8 holes, $\frac{3}{4}$ inch in diameter, equally spaced on a 37-inch circle.

Both ends of Insulator are provided with removable bronze terminals having holes $1\frac{1}{16}$ inches in diameter, $2\frac{1}{4}$ inches deep; tinned for soldering.

Connection through the Insulator is made by seamless brass tubing.

Insulator must be filled with transformer oil or insulating compound, an attachment being provided for that purpose on the metal flange.

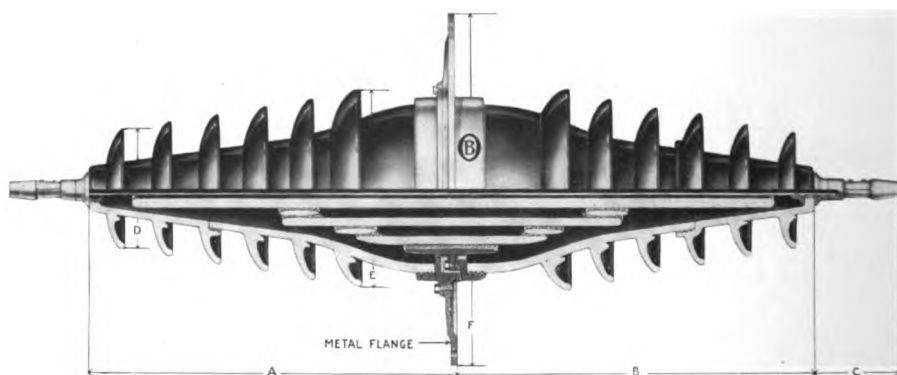
Code Word	No.	Working Voltage	Dimensions in Inches							Net Weight Each, Lbs.	List Each
			A	B	C	D	E	F	G		
<i>Mootable.</i>	11909	150,000	9	$39\frac{1}{4}$	39	$7\frac{1}{4}$	$13\frac{1}{4}$	22	40	1,000	\$715 00

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Roof Insulator

150,000 Volts



THIS Insulator may be exposed to the weather in a vertical position.

Metal flange for mounting Insulator in roof has 8 holes, $\frac{3}{4}$ inch in diameter, equally spaced on a 37-inch circle.

Both ends of Insulator are provided with removable bronze terminals having holes $1\frac{1}{16}$ inches in diameter, $2\frac{1}{4}$ inches deep; tinned for soldering.

Connection through Insulator is made by seamless brass tubing.

Insulator must be filled with transformer oil or insulating compound poured through the brass tubing.

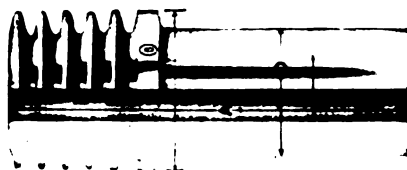
Code Word	No.	Working Voltage	Dimensions in Inches						Net Weight Each, Lbs.	List Each
			A	B	C	D	E	F		
<i>Mootman.</i>	11911	150,000	39 $\frac{3}{4}$	39	8 $\frac{3}{4}$	13 $\frac{1}{2}$	22	40	1025	\$759 00

See Wall and Roof Entrance Schemes on pages 350-352.

The actual working voltage should be specified on all orders or inquiries.

O-B Porcelain Bushings

High Tension—Form 1



Code Word	No.	Dimensions in Inches						Test Voltage	List Each
		A	B	C	D	E	F		
<i>Insapory.</i>	10880	8	3	5	3½	1¼	4	30,000	\$ 3 30
<i>Insatiably.</i>	10881	8	3	5	3½	2	4	30,000	3 30
<i>Insatiety.</i>	10882	8	3	5	4¼	1¼	5	30,000	3 60
<i>Inscience.</i>	10883	8	3	5	4¼	2	5	30,000	3 60
<i>Inscient.</i>	10884	8	3	5	5	3	5½	30,000	3 85
<i>Insconce.</i>	10885	8	3	5	5	1¼	5½	30,000	3 85
<i>Inscriber.</i>	10886	8	3	5	5	2	5½	30,000	3 85
<i>Inscroll.</i>	10887	10	4	6	3½	1¼	4	40,000	4 20
<i>Insculp.</i>	10888	10	4	6	3½	2	4	40,000	4 20
<i>Insecable.</i>	10889	10	4	6	4¼	1¼	5	40,000	4 40
<i>Insecta.</i>	10890	10	4	6	4¼	2	5	40,000	4 40
<i>Insector.</i>	10891	10	4	6	5	3	5½	40,000	4 85
<i>Insected.</i>	10892	10	4	6	5	1¼	5½	40,000	4 85
<i>Insectile.</i>	10893	10	4	6	5	2	5½	40,000	4 85
<i>Insensate.</i>	10894	14	6	8	3½	1¼	4	55,000	5 50
<i>Inservient.</i>	10895	14	6	8	3½	2	4	55,000	5 50
<i>Insession.</i>	10896	14	6	8	4¼	1¼	5	55,000	6 05
<i>Insessor.</i>	10897	14	6	8	4¼	2	5	55,000	6 05
<i>Inshaded.</i>	10898	14	6	8	5	3	5½	55,000	6 30
<i>Inshave.</i>	10899	14	6	8	5	1¼	5½	55,000	6 30
<i>Inshrine.</i>	10900	14	6	8	5	2	5½	55,000	6 30
<i>Insignia.</i>	10901	18	8	10	3½	1¼	4	70,000	7 05
<i>Insinew.</i>	10902	18	8	10	4¼	1½	5	70,000	7 05
<i>Insinuator.</i>	10903	18	8	10	4¼	2	5	70,000	7 50
<i>Insition.</i>	10904	18	8	10	5	1¼	5½	70,000	7 50
<i>Insnarer.</i>	10905	18	8	10	5	2	5½	70,000	8 50
<i>Insnarl.</i>	10906	18	8	10	5	3	5½	70,000	8 50
<i>Insperse.</i>	10907	22	10	12	4¼	1¼	5	85,000	9 15
<i>Insphere.</i>	10908	22	10	12	5	1¼	5½	85,000	9 15
<i>Inspirator.</i>	10909	22	10	12	5	2	5½	85,000	9 80
<i>Inspirer.</i>	10910	22	10	12	5	3	5½	85,000	9 80
<i>Inspirit.</i>	10911	26	12	14	4¼	1¼	5	100,000	11 45
<i>Instancy.</i>	10912	26	12	14	5	1¼	5½	100,000	11 45
<i>Instaure.</i>	10913	26	12	14	5	2	5½	100,000	11 45

Note—Above bushings are regularly furnished white glazed.

The actual working voltage, thickness of wall, floor, etc., and whether for indoor or outdoor service, should be specified on all orders or inquiries.

O-B Porcelain Bushings

High Tension—Form 2

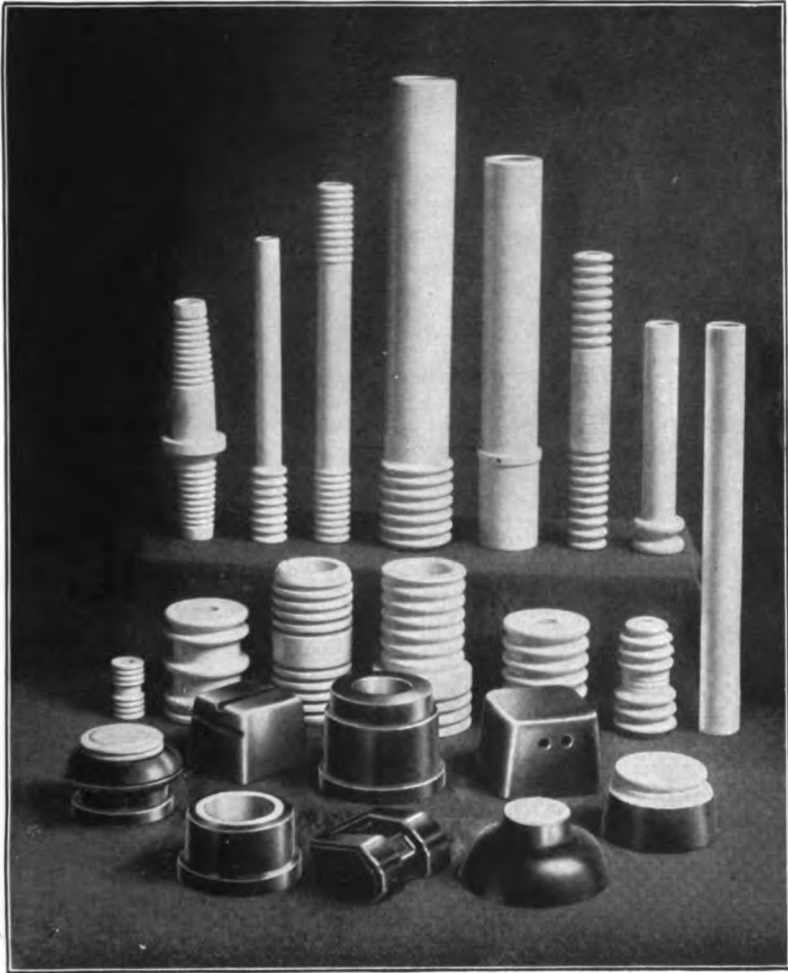


Code Word	No.	Dimensions in Inches						Test Voltage	List Each
		A	B	C	D	E	F		
<i>Instleep.</i>	10914	8	3	5	3½	1½	4	30,000	\$ 3 65
<i>Instigator.</i>	10915	8	3	5	3½	2	4	30,000	3 65
<i>Instill.</i>	10916	8	3	5	4½	1½	5	30,000	3 85
<i>Instiller.</i>	10917	8	3	5	4½	2	5	30,000	3 85
<i>Institutor.</i>	10918	8	3	5	5	3	5½	30,000	4 20
<i>Insuctude.</i>	10919	8	3	5	5	1½	5½	30,000	4 20
<i>Insular.</i>	10920	8	3	5	5	2	5½	30,000	4 20
<i>Insulary.</i>	10921	10	4	6	3½	1½	4	40,000	4 40
<i>Insulous.</i>	10922	10	4	6	3½	2	4	40,000	4 40
<i>Insulsity.</i>	10923	10	4	6	4½	1½	5	40,000	4 85
<i>Insulter.</i>	10924	10	4	6	4½	2	5	40,000	4 85
<i>Insumc.</i>	10925	10	4	6	5	3	5½	40,000	5 50
<i>Insurable.</i>	10926	10	4	6	5	1½	5½	40,000	5 50
<i>Insurancer.</i>	10927	10	4	6	5	2	5½	40,000	5 50
<i>Insurant.</i>	10928	14	6	8	3½	1½	4	55,000	6 05
<i>Insurgent.</i>	10929	14	6	8	3½	2	4	55,000	6 05
<i>Intaglio.</i>	10930	14	6	8	4½	1½	5	55,000	6 30
<i>Integral.</i>	10931	14	6	8	4½	2	5	55,000	6 30
<i>Integrally.</i>	10932	14	6	8	5	3	5½	55,000	6 95
<i>Integrant.</i>	10933	14	6	8	5	1½	5½	55,000	6 95
<i>Integrate.</i>	10934	14	6	8	5	2	5½	55,000	6 95
<i>Integer.</i>	10935	18	8	10	3½	1½	4	70,000	7 95
<i>Inrader.</i>	10936	18	8	10	4½	1½	5	70,000	7 95
<i>Invariant.</i>	10937	18	8	10	4½	2	5	70,000	8 50
<i>Invasion.</i>	10938	18	8	10	5	1½	5½	70,000	8 50
<i>Integrator.</i>	10939	18	8	10	5	2	5½	70,000	9 05
<i>Intemerate.</i>	10940	18	8	10	5	3	5½	70,000	9 05
<i>Intenable.</i>	10941	22	10	12	4½	1½	5	85,000	9 70
<i>Intendant.</i>	10942	22	10	12	5	1½	5½	85,000	9 70
<i>Intender.</i>	10943	22	10	12	5	2	5½	85,000	10 25
<i>Intenible.</i>	10944	22	10	12	5	3	5½	85,000	10 25
<i>Intensate.</i>	10945	26	12	14	4½	1½	5	100,000	12 10
<i>Interaulic.</i>	10946	26	12	14	5	1½	5½	100,000	12 10
<i>Interazal.</i>	10947	26	12	14	5	2	5½	100,000	12 10

Note—Above Bushings are regularly furnished white glazed.

The actual working voltage, thickness of wall, floor, etc., and whether for indoor or outdoor service, should be specified on all orders or inquiries.

Special O-B Porcelains

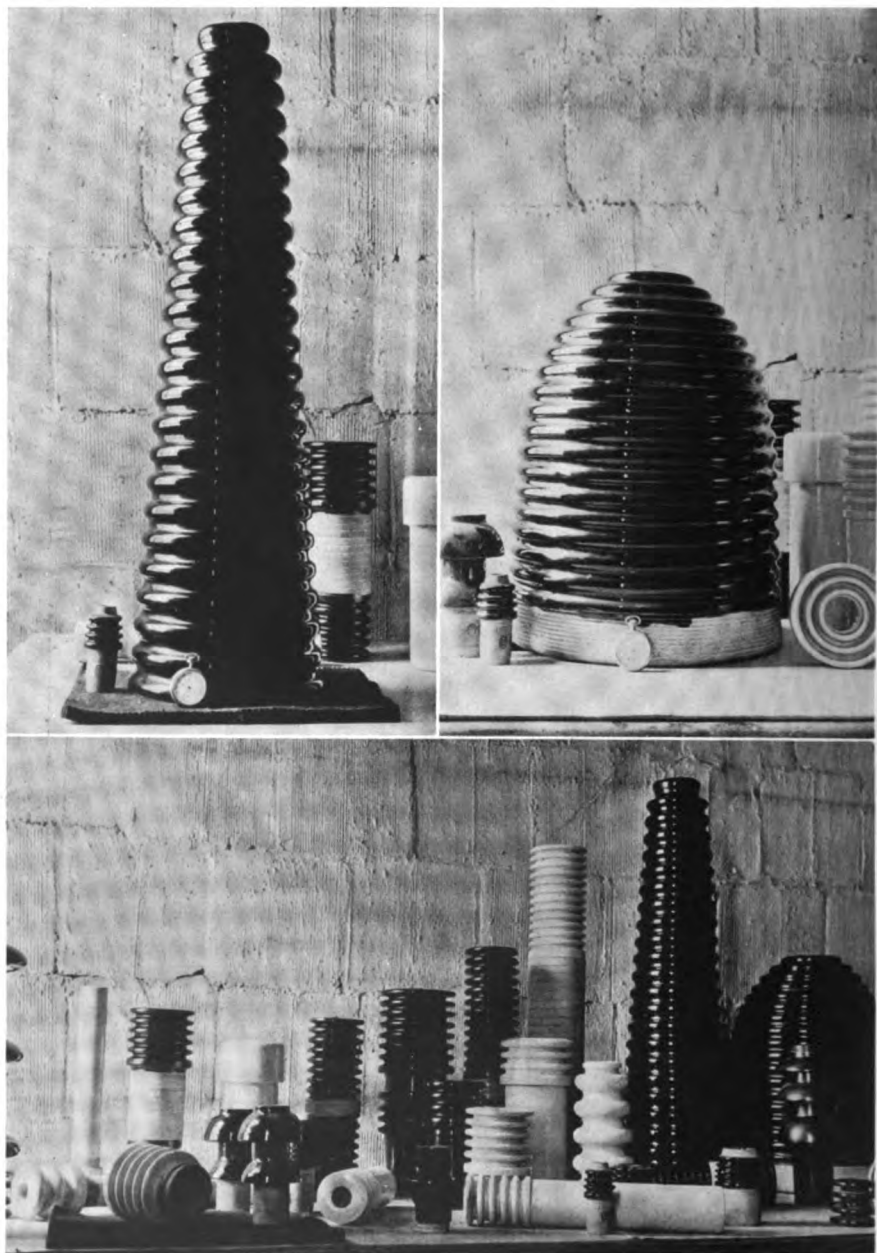


THE above group of high tension Porcelain Tubes, Bushings and Third Rail Insulator Blocks illustrates, in a general way, our wide facilities for manufacturing special porcelain.

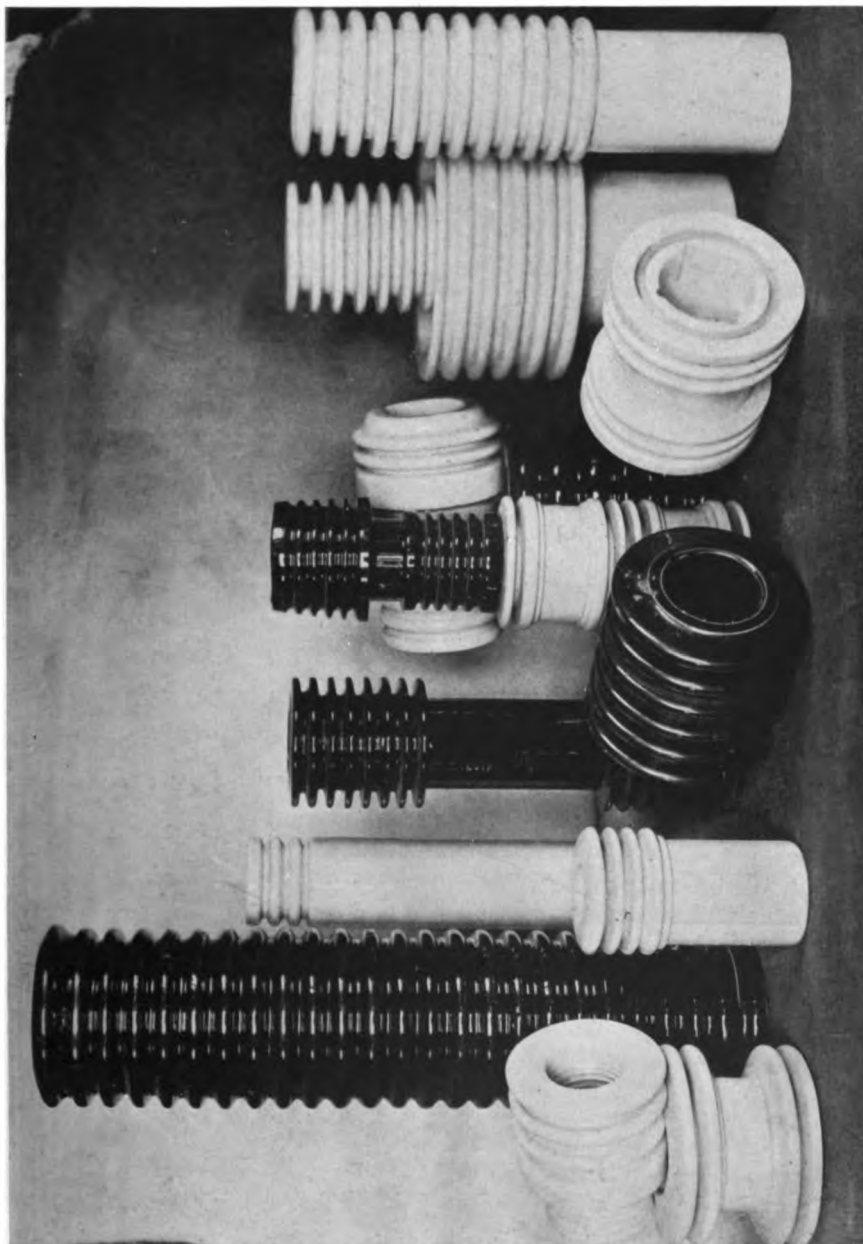
Tubes can be made any length up to 6 feet and with a maximum outside diameter of $5\frac{1}{2}$ inches or larger depending upon length required.

Length, working voltage and method of mounting the Tube should always be stated on all orders or inquiries.

Special O-B Porcelains



Special O-B Porcelain Bushings



Suspension Wire Clamp

Patented

Type A



THIS Clamp is used for supporting high tension transmission wire and is designed for attachment directly to the ball pin of suspension insulators.

The wire is held in the Clamp by a staggered "U" shaped forging which can be rotated about one arm sufficiently to permit the wire being inserted without removing the nuts, thus eliminating the handling of loose parts.

The Clamp is recommended for use with copper wire only. The wire groove will accommodate a wire from $\frac{3}{8}$ to $\frac{1}{2}$ inch in diameter. The wire groove is 5 inches long and the height of the Clamp from the center of the socket to the bottom of the wire is 3 inches. The weight, packed, is 281 pounds per 100.

Code Word
Interpale.

No. 11026—Clamp, Malleable Iron, Galv. for Type A Insulators.....

List per 100

\$93 50

Clamps for special conditions can be furnished on application.

Suspension Wire Clamp

Patent Applied For

Type B, Form 1



FOR attachment direct to ball pin of suspension insulators to support high tension transmission wires.

Swivel connection between body of Clamp and socket prevents severe bending strains on center pin of insulator which, owing to long wire seat and consequent leverage, would otherwise be caused by insulator taking strain position, should the transmission wire break.

Sizes of cable given in table below are for copper; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{8}$ inch thick should encircle the cable in the Clamp and the diameter should be measured over sleeve.

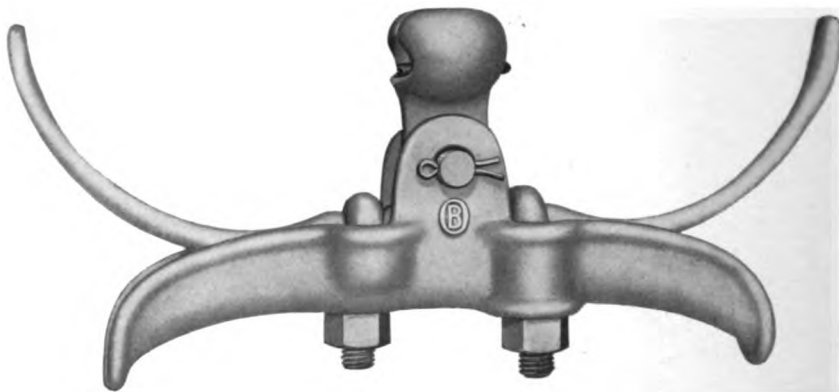
Wire seat is 9 inches long and has a maximum grip without injuring the wire. Cotter pins are brass. Castings are malleable iron, galvanized. Height, center socket to bottom wire, 4 inches.

Code Word	No.	Diameter Copper Cable, Inches		Insulators Used With	Weight Packed Per 100	List Per 100
		Min.	Max.			
<i>Interpel.</i>	10879	$\frac{1}{8}$	$\frac{7}{16}$	Type A	417	\$110 00
<i>Mopboard.</i>	11538	$\frac{1}{8}$	$\frac{7}{16}$	Type B	417	110 00
<i>Mopeful.</i>	11539	$\frac{1}{8}$	$\frac{7}{16}$	Type A	524	137 50
<i>Moraine.</i>	11540	$\frac{1}{8}$	$\frac{7}{16}$	Type B	524	137 50

Clamps cannot be interchanged between Type A and Type B Insulators.
Clamps for special conditions can be furnished on application.

Suspension Wire Clamp

Patent Applied For
Type BH, Form 1



FOR attachment direct to ball pin of suspension insulators to support high tension transmission wires. Differs from the Type B, Form 1 Clamp listed on preceding page in having discharge horns which are desirable under certain conditions, as they cut down the time lag for excessive surges and increase the factor of safety of the insulators.

Swivel connection between body of Clamp and socket prevents severe bending strains on center pin of insulator which, owing to long wire seat and consequent leverage, would otherwise be caused by insulator taking strain position, should the transmission wire break.

Sizes of cable given in table below are for copper; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{16}$ inch thick should encircle the cable in the Clamp and the diameter should be measured over sleeve.

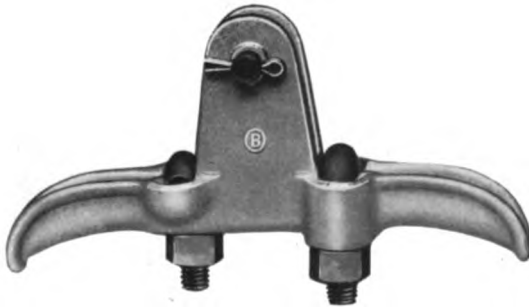
Wire seat has a maximum grip without injuring the wire. Cotter pins are brass. Castings are malleable iron, galvanized.

Code Word	No.	Diam. Copper Cable, Inches		Height, Inches, Center Socket to Bottom Wire	Length Wire Seat Inches	Insulators Used With	Weight Packed Per 100	List Per 100
		Min.	Max.					
<i>Moralism.</i>	11548	$\frac{3}{16}$	$\frac{7}{16}$	4	9	Type A	504	\$132 00
<i>Morality.</i>	11549	$\frac{3}{16}$	$\frac{7}{16}$	4	9	Type B	504	132 00
<i>Moralize.</i>	11550	$\frac{3}{16}$	$\frac{11}{16}$	4	9	Type A	607	165 00
<i>Moration.</i>	11551	$\frac{3}{16}$	$\frac{11}{16}$	4	9	Type B	607	165 00
<i>Morbid.</i>	11643	$\frac{3}{16}$	1	$4\frac{1}{16}$	$11\frac{1}{2}$	Type A	840	210 00
<i>Morbose.</i>	11644	$\frac{3}{16}$	1	$4\frac{1}{16}$	$11\frac{1}{2}$	Type B	840	210 00

Clamps cannot be interchanged between Type A and Type B Insulators. Clamps for special conditions can be furnished on application.

Suspension Wire Clamp

Type F, Form 1



USED for supporting high tension transmission wires and is attached directly to our Type D and other makes of suspension insulators having an eye pin.

Can be used with conductors $\frac{3}{16}$ to $\frac{5}{8}$ inch in diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{16}$ inch thick should completely encircle cable in clamp and diameter should be measured over sleeves.

Wire seat is 9 inches long and has a maximum grip without injuring the wire. Cotter pins are brass.

Height, center clevis bolt to bottom wire, $2\frac{3}{4}$ inches; diameter clevis bolt, $\frac{1}{2}$ inch; width, $1\frac{1}{8}$ inch.

Weight packed, per 100, is 330 pounds.

Code Word
Mordant.

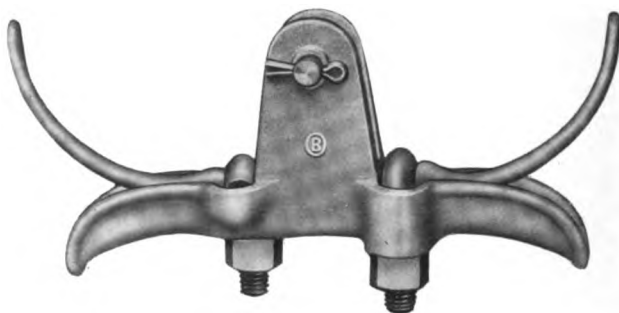
No. 11552—Type F Clamp, Malleable Iron, Galv., for Type D Insulator. \$80 00

List per 100

Clamps for special conditions can be furnished on application.

Suspension Wire Clamp

Type FH—Form 1



USED for supporting high tension transmission wires and is attached directly to our Type D and other makes of suspension insulators having an eye pin.

Differs from Type F, Form 1 Clamp listed on the preceding page in having discharge horns which are desirable under certain conditions as they cut down the time lag for excessive surges and increase the factor of safety of the insulator.

Can be used with conductors $\frac{1}{8}$ to $\frac{3}{4}$ inch in diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{8}$ inch thick should completely encircle cable in clamp and diameter should be measured over sleeves.

Wire seat is 9 inches long and has a maximum grip without injuring the wire. Cotter pins are brass.

Height, center clevis bolt to bottom wire, $2\frac{1}{4}$ inches; diameter clevis bolt, $\frac{1}{2}$ inch; width, $\frac{1}{4}$ inch.

Weight packed, per 100, is 404 pounds.

Code Word
Moreen.

No. 11944—Clamp, Mall. Iron, Galv.. for Type D Insulator \$100 00

List per 100

Clamps for special conditions can be furnished on application.

Suspension Strain Wire Clamp

Type E, Form 1—Patented



Nos. 11041-11541

FOR use with high tension transmission wire. No loose parts need be handled in installing as hook bolts which grip wire can be loosened and turned out of way while wire is being seated in groove.

Strain insulators are installed so as to take a position nearly horizontal when wire enters clamp horizontally and passes out below insulator in the form of a loose jumper.

Can be used with conductors from $\frac{1}{8}$ to $\frac{1}{2}$ inch diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{8}$ inch thick should encircle cable in Clamp and diameter should be measured over sleeve.

Clevis is provided with a $\frac{1}{2} \times 1\frac{5}{8}$ -inch steel rivet and brass cotter pin.

Ultimate strength is approximately 9,000 pounds.

Castings are malleable iron, galvanized.

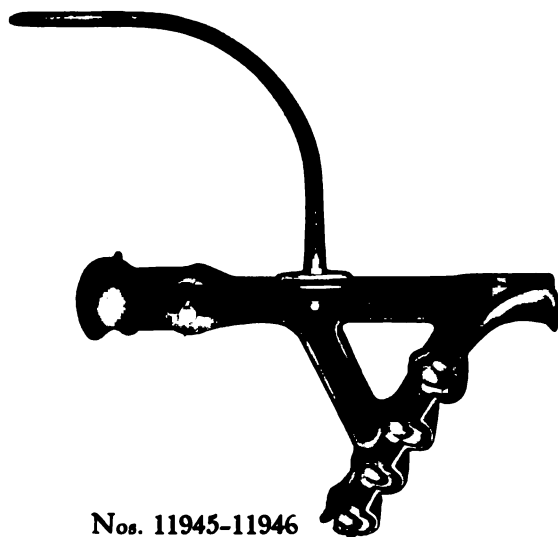
Code Word	No.	No. Socket Eye Used	Insulators Used With	Weight Packed Per 100	List Per 100
<i>Interplay.</i>	11041	10757	Type A	646	\$209 00
<i>Morelle.</i>	11541	11544	Type B	646	209 00
<i>Homotype.</i>	10755	.....	Eye Pin	540	176 00

Clamps cannot be interchanged between Type A and Type B Insulators.

Clamps for special conditions can be furnished on application.

Suspension Strain Wire Clamp

Type EH—Form 1—Patented



Nos. 11945-11946

FOR use with high tension transmission wire. No loose parts need be handled in installing as hook bolts which grip wire can be loosened and turned out of way while wire is being seated in groove.

Differs from Type E, Form 1 Clamp listed on preceding page in having a discharge horn which is desirable under certain conditions, as it cuts down the time lag for excessive surges and increases the factor of safety of the insulator.

Strain insulators are installed so as to take a position nearly horizontal when wire enters clamp horizontally and passes out below insulator in the form of a loose jumper.

Can be used with conductors from $\frac{3}{16}$ to $\frac{1}{2}$ inch diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{16}$ inch thick should encircle cable in Clamp and diameter should be measured over sleeve.

Clevis is provided with a $\frac{1}{2} \times 1\frac{1}{8}$ -inch steel rivet and brass cotter pin.

Ultimate strength is approximately 9,000 pounds.

Castings are malleable iron, galvanized.

Code Word	No.	No. Socket Eye Used	Insulators Used with	Weight Packed Per 100	List Per 100
<i>Morgay.</i>	11945	10757	Type A	746	\$253 00
<i>Morian.</i>	11946	11544	Type B	746	253 00
<i>Moribund.</i>	11947		Eye Pin	640	220 00

Clamps cannot be interchanged between Type A and Type B Insulators.
Clamps for special conditions can be furnished on application.

Suspension Strain Wire Clamp

Type E, Form 2—Patented



Nos. 11035-11542

DIFFERS from Form 1 listed on page 377 in size of the wire groove and in position of hook bolts with respect to body.

Has the advantage of greater ease in installing where a protecting sleeve is used around conductor, as lower sleeve can be installed in Clamp by bending ends back over ends of groove before wire is inserted.

No loose parts need be handled in installing as hook bolts can be loosened and turned back out of the way while wire is being seated in groove.

Can be used with conductors from $\frac{1}{2}$ to $\frac{1\frac{1}{8}}{16}$ inch diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{16}$ inch thick should encircle cable in Clamp and diameter should be measured over sleeve.

Clevis is provided with a $\frac{1}{2} \times 1\frac{5}{8}$ -inch steel rivet and brass cotter pin.

Ultimate strength is approximately 10,000 pounds.

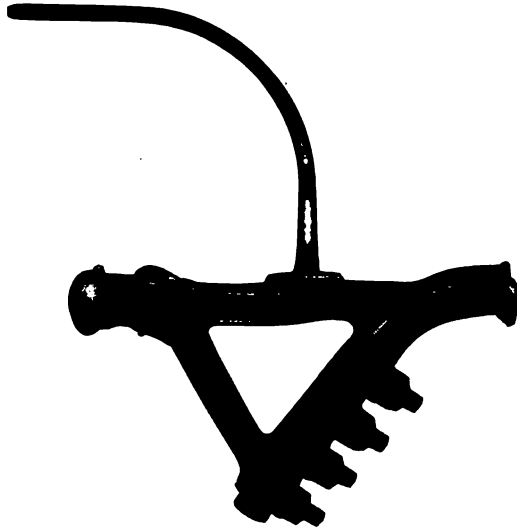
Castings are malleable iron, galvanized.

Code Word	No.	No. Socket Eye Used	Insulators Used With	Weight Packed Per 100	List Per 100
<i>Interplead.</i>	11035	10757	Type A	697	\$214 50
<i>Morinda.</i>	11542	11544	Type B	697	214 50
<i>Interpone.</i>	11040	.....	Eye Pin	591	181 50

Clamps cannot be interchanged between Type A and Type B Insulators.
Clamps for special conditions can be furnished on application.

Suspension Strain Wire Clamp

Type EH—Form 2—Patented



Nos. 11948-11949

DIFFERS from Type E, Form 2 listed on preceding page in having a discharge horn which is desirable under certain conditions, as it cuts down the time lag for excessive surges and increases the factor of safety of the insulator.

Has the advantage of great ease in installing where a protecting sleeve is used around conductor, as lower sleeve can be installed in Clamp by bending ends back over ends of groove before wire is inserted.

No loose parts need be handled in installing as hook bolts can be loosened and turned back out of the way while wire is being seated in groove.

Can be used with conductors from $\frac{1}{4}$ to $\frac{1}{2}$ inch diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{16}$ inch thick should encircle cable in Clamp and diameter should be measured over sleeve.

Clevis is provided with a $\frac{1}{2} \times 1 \frac{1}{8}$ -inch steel rivet and brass cotter pin. Ultimate strength is approximately 10,000 pounds.

Castings are malleable iron, galvanized.

Code Word	No.	No. Socket Eye Used	Insulators Used With	Weight Packed Per 100	List Per 100
<i>Mormon.</i>	11948	10757	Type A	797	\$258 50
<i>Mornward.</i>	11949	11544	Type B	797	258 50
<i>Morocco.</i>	11950	.....	Eye Pin	691	225 50

Clamps cannot be interchanged between Type A and Type B Insulators.
Clamps for special conditions can be furnished on application.

Suspension Strain Wire Clamp

Type E, Form 3—Patented



Nos. 11327-11543

OF same general design as Type E, Form 2 shown on page 379, but will accommodate a larger wire, is heavier and has a longer radius curve in wire seat.

No loose parts need be handled in installing as hook bolts which grip wire can be turned back out of the way while wire is being seated in groove.

Can be used with conductors from $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{8}$ inch thick should encircle cable in Clamp and diameter should be measured over sleeve.

Lower sleeve can be installed in Clamp by bending ends back over ends of groove before wire is inserted.

Clevis is provided with a $\frac{1}{2} \times 1\frac{5}{8}$ -inch steel rivet and brass cotter pin.

Ultimate strength, approximately 12,000 pounds.

Castings are malleable iron, galvanized.

Code Word	No.	No. Socket Eye Used	Insulators Used With	Weight Packed Per 100	List Per 100
<i>Labarum.</i>	11327	10757	Type A	859	\$231 00
<i>Morone.</i>	11543	11544	Type B	859	231 00
<i>Labefy.</i>	11328	.....	Eye Pin	753	198 00

Clamps cannot be interchanged between Type A and Type B Insulators.
Clamps for special conditions can be furnished on application.

Suspension Strain Wire Clamp

Type EH—Form 3—Patented



Nos. 11951-11952

DIFFERS from Type E, Form 3 Clamp listed on preceding page in having a discharge horn which is desirable under certain conditions, as it cuts down the time lag for excessive surges and increases the factor of safety of the insulator.

No loose parts need be handled in installing as hook bolts which grip wire can be turned back out of the way while wire is being seated in groove.

Can be used with conductors from $\frac{1}{2}$ to $\frac{3}{4}$ inch diameter; when aluminum cable is used, an aluminum protecting sleeve about $\frac{1}{8}$ inch thick should encircle cable in Clamp and diameter should be measured over sleeve.

Lower sleeve can be installed in Clamp by bending ends back over ends of groove before wire is inserted.

Clevis is provided with a $\frac{1}{2} \times 1 \frac{1}{8}$ -inch steel rivet and brass cotter pin.

Ultimate strength is approximately 12,000 pounds.

Castings are malleable iron, galvanized.

Code Word	No.	No. Socket Eye Used	Insulators Used With	Weight Packed Per 100	List Per 100
<i>Morrow.</i>	11951	10757	Type A	959	\$275 00
<i>Morsel.</i>	11952	11544	Type B	959	275 00
<i>Morsure.</i>	11953	.....	Eye Pin	853	242 00

Clamps cannot be interchanged between Type A and Type B Insulators.

Clamps for special conditions can be furnished on application.

Suspension Strain Wire Clamp

Type E, Form 4—Patented



MUCH heavier than Type E Clamps listed on preceding pages and intended for use where strain is particularly heavy.

It is frequently used for copper-clad and steel conductors on long spans.

Wire groove is provided with rounded ribs giving great holding power even when a protecting sleeve is used around the conductor.

To be used with $\frac{5}{8}$ -inch diameter conductors; when protecting sleeve is used around conductor, diameter should be measured over the sleeve.

Regularly furnished without socket for attachment directly to clevis of strain yoke shown on page 384. If, however, it is desired to use Clamp with a single string of insulators, Ball Socket Eye for either Type A or Type B Insulator and connecting bolt can be furnished.

Diameter hole in clevis $\frac{1}{2}$ inch; width clevis opening, $\frac{5}{8}$ inch. Ultimate strength, approximately 17,000 pounds.

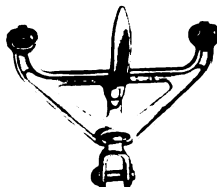
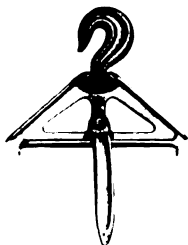
Weight, packed, 1,155 pounds per 100.

Code Word
Mortify.

No.	List per 100
11645—Clamp, Malleable Iron, Galvanized	\$275 00

Clamps for special conditions can be furnished on application.

Insulator Strain Yoke



FOR particularly heavy strains at dead ends, etc., or for double construction at railway crossings, two strings of Suspension Insulators may be connected in multiple by means of these yokes which are provided with discharge horns.

Opening in hook, $1\frac{3}{8}$ inch; opening in clevis, $1\frac{3}{8}$ inch; diameter clevis bolt, $\frac{3}{4}$ inch.

Castings malleable iron. All parts galvanized.

Code Word	No.	List per 100
<i>Mortling.</i>	11685—Upper Yoke, with Hook, for Type A Insulators	\$275 00
<i>Mortpay.</i>	11686—“ “ “ “ “ B “	275 00
<i>Mosaic.</i>	11687—Lower “ “ Clevis “ “ A “	264 00
<i>Mosaism.</i>	11688—“ “ “ “ “ B “	264 00

Upper Yokes can be furnished with clevis instead of hook if desired.

Ball Socket Eye



FOR use with Type E Strain Clamps and any other clamp having a clevis for attachment. The eye is $\frac{9}{16}$ inch in diameter and the distance from center of socket to center of eye is $2\frac{1}{8}$ inches. The weight, packed, is 111 pounds per 100. Width of shank, $1\frac{1}{2}$ inches; thickness $\frac{1}{2}$ -inch.

Code Word	No.	List per 100
<i>Hopbine.</i>	10757—Socket Eye, Malleable Iron, Galv., for Type A Insulators	\$33 00
<i>Moschatel.</i>	11544—“ “ “ “ “ “ “ “ B “	33 00

Ball Socket Clevis



CAN be used for attaching any clamp having an eye to the ball center pin of Suspension Insulators. The clevis bolt is $\frac{5}{8}$ inch in diameter and the distance from center of clevis bolt to center of socket is 2 inches. Cotter pins are brass. Width of Clevis opening is $\frac{13}{16}$ inch. The weight, packed, is 145 pounds per 100.

Code Word	No.	List per 100
<i>Horation.</i>	10758—Socket Clevis, Malleable Iron, Galv., for Type A Insulators	\$37 40
<i>Moslem.</i>	11545—“ “ “ “ “ “ “ “ B “	37 40

Fittings cannot be interchanged between Type A and Type B Insulators.

Special fittings for use with all types of Suspension Insulators can be furnished on application.

Suspension Hook



THIS Hook is used for attaching standard Suspension or Suspension Strain Insulators to towers. The opening of the Hook is closed by the insulator cap, thus preventing unhooking after installation. The distance from the center of the ball to the surface supporting the hook is only 2 inches. The weight, packed, is 94 pounds per 100.

Code Word	No.	List per 100
<i>Hornel.</i>	10756—Hook, Malleable Iron, Galv., for Type A Insulators.....	\$22 00
<i>Mossback.</i>	11546— “ “ “ “ “ “ B “	22 00

Suspension Eye



Used for attaching standard Suspension or Suspension Strain Insulators to towers.

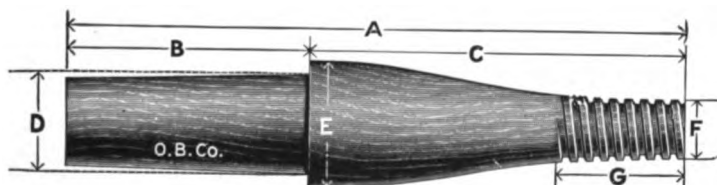
Made of drop forged steel, galvanized.

Code Word	No.	Insulators Used With	Height, Inches Center Eye to Center Ball	Diameter Eye Inches	Weight Packed Per 100	List Per 100
<i>Handcuff.</i>	10594	Type A	2	$\frac{1}{2}$	63	\$22 00
<i>Invacuo.</i>	11106	Type A	$1\frac{1}{2}$	$\frac{3}{4}$	44	21 45
<i>Motacil.</i>	11547	Type B	$1\frac{1}{2}$	$\frac{1}{2}$	49	22 00

Fittings cannot be interchanged between Type A and Type B Insulators.

Special fittings for use with all types of Suspension Insulators can be furnished on application.

Wood Pins



THESE Pins are made from the best of selected stock, and have been designed particularly for use with the High Tension Insulators illustrated on the preceding pages.

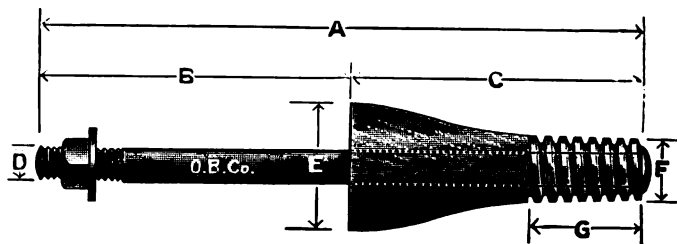
All oak and locust pins are furnished plain with the exception of Pin No. 1248, which is painted.

Pins can be furnished to order impregnated with insulating compound, when desired. Special sizes not listed below can also be furnished on short notice.

Code Word	No.	Stock	Dimensions in Inches							List per 100
			A	B	C	D	E	F	G	
<i>Cantata.</i>	2639	Locust	8	4	4	1½	1½	1	2	\$2 90
<i>Cantide.</i>	1248	Oak	9	4½	4½	1½	1½	1	2½	2 20
<i>Cantlet.</i>	1249	Locust	9	4½	4½	1½	1½	1	2½	3 85
<i>Captain.</i>	7863	Locust	11½	4½	7½	1½	2	1½	2½	7 70

Steel Pins

With All Wood Top



CONSIST of a high carbon steel bolt fitted with a nut and washer and a paraffined wood top. They are strong and durable and will withstand considerable lateral strain.

They also possess the advantage of requiring but a small hole in the cross arm, which adds considerably to the strength of the latter.

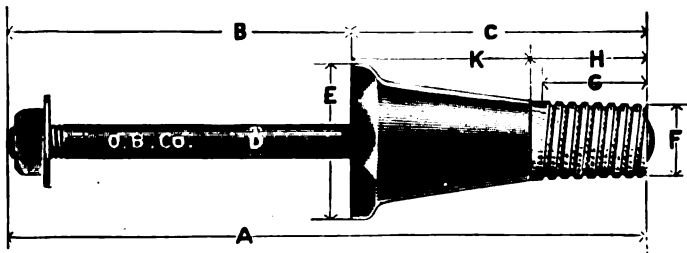
Furnished with two sizes of threaded ends, the standard being 1 inch, and the large size $1\frac{3}{8}$ inches in diameter at the upper end.

Bolts, nuts and washers are sherardized.

Code Word	No.	Dimensions in Inches							List per 100
		A	B	C	D	E	F	G	
<i>Canaster.</i>	9488	6	1	5	$1\frac{1}{2}$	$2\frac{1}{4}$	1	2	\$16 85
<i>Candify.</i>	9489	9	5	4	$1\frac{1}{2}$	$1\frac{1}{8}$	1	2	
<i>Cannon.</i>	9493	$10\frac{1}{2}$	$5\frac{3}{4}$	5	$1\frac{1}{2}$	$2\frac{1}{4}$	1	2	22 00
<i>Kirkman.</i>	10805	9	$5\frac{1}{2}$	4	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{3}{4}$	2	25 85
<i>Canonist.</i>	9495	$10\frac{1}{2}$	$5\frac{3}{4}$	5	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{3}{4}$	2	25 85
<i>Kitchen.</i>	11357	$11\frac{1}{2}$	$5\frac{3}{4}$	6	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{3}{4}$	2	26 40
<i>Haggle.</i>	9497	13	6	7	$2\frac{1}{2}$	$2\frac{1}{4}$	$1\frac{3}{4}$	2	33 00
<i>Halfness.</i>	9499	14	6	8	$2\frac{3}{4}$	$2\frac{3}{4}$	$1\frac{3}{4}$	2	35 20
<i>Hallage.</i>	9501	15	6	9	3	3	1	2	39 60

Steel Pins

With Porcelain Base



THREADED portion is made of thoroughly paraffined oak. Bolt is forged from high carbon steel and binds the broad porcelain base to the cross arm so as to give maximum strength.

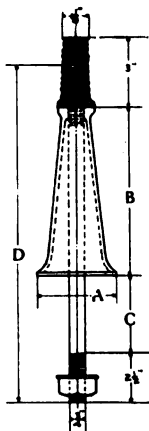
Pin is not subject to deterioration by weathering or burning, and adds to the electrical strength of the Insulator.

Bolts, nuts and washers are sherardized.

Code Word	No.	Dimensions in Inches									List per 100
		A	B	C	D	E	F	G	H	K	
<i>Endurant.</i>	10481	6	1	5	$1\frac{1}{2}$	$2\frac{3}{4}$	1	$1\frac{1}{2}$	2	3	\$25 30
<i>Engross.</i>	10484	$10\frac{1}{2}$	$5\frac{1}{2}$	5	$1\frac{1}{2}$	$2\frac{3}{4}$	1	$1\frac{1}{2}$	2	3	29 70
<i>Killing.</i>	10806	$10\frac{1}{2}$	$5\frac{1}{2}$	5	$1\frac{1}{2}$	$2\frac{3}{4}$	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$2\frac{3}{4}$	35 20
<i>Knabble.</i>	11358	$11\frac{1}{2}$	$5\frac{1}{2}$	6	$1\frac{1}{2}$	4	$1\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{2}$	43 50
<i>Halved.</i>	10589	13	6	7	$1\frac{1}{2}$	3	$1\frac{1}{2}$	2	$3\frac{1}{2}$	$3\frac{1}{2}$	41 25
<i>Hamster.</i>	10591	15	6	9	$1\frac{1}{2}$	$3\frac{1}{2}$	1	2	$3\frac{1}{2}$	$5\frac{1}{2}$	53 35

Lee Type Insulator Pins

Separable Top—Patented



THE advantage of using the above Pins in place of one-piece cemented pins lies in the fact that the small removable tops can be carefully cemented into the insulators at the factory. The base castings can then be mounted on the pole or cross arm and the insulators installed at any convenient time. This relieves the customer of the annoyance of cementing during the erection of the line, permits of safe shipment which is not possible with one-piece pins cemented into the insulators, and greatly simplifies replacing broken insulators.

Consists of only three parts—the base casting, thimble casting and stud bolt with nut—the stud bolt passing through the base casting and threading into the cap. Thimbles are interchangeable on these Pins and the Pole Top Pins listed on the following page.

As listed the pins are plain finished but they can be furnished galvanized if desired.

Code Word	No.	Dimensions—Inches				List per 100
		A	B	C	D	
<i>Laniate.</i>	11325	3	3½	4½	11½	\$ 68 65
<i>Motation.</i>	11954	3	4½	4½	13	77 25
<i>Interlard.</i>	11005	3½	6	4½	14½	85 80
<i>Lanier.</i>	11326	3½	10	4½	18½	113 20
<i>Intermarry.</i>	11008	4½	11	4½	19½	128 40

Any of above pins can be furnished with thimble ½ inch in diameter to fit 1-inch pin hole in insulator.

Pins can be furnished with varying length stud bolts to suit any conditions.

Pole Top Pin

With Separable Top



CONSISTS of two malleable iron castings fastened together by a threaded stud screwing into both.

Thimbles may be cemented into insulators at factory, and castings mounted on poles and insulators installed at any time.

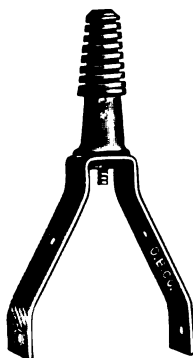
This relieves customer of annoyance of cementing pins into insulators and, at same time, permits of safe shipment, which is not possible with one-piece pins cemented into the insulators.

A lead washer between base and thimble casting assures a tight joint when wire groove of insulator is aligned with wire. Thimbles are interchangeable on these Pins and the Lee Pins listed on the preceding page.

Pins are furnished plain but can be furnished galvanized, if desired.

Code Word	No.	Length overall	Distance between Hole Centers	Height above Top Hole	Diameter of Pin Top	Diameter of Bolt Holes	List per 100
<i>Furrier.</i>	9883	16 $\frac{1}{4}$ in.	5 in.	11 in.	1 $\frac{1}{8}$ in.	$\frac{1}{16}$ in.	\$ 90 20
<i>Furrow.</i>	9884	20 $\frac{1}{4}$ "	6 "	14 "	1 $\frac{1}{8}$ "	$\frac{1}{16}$ "	116 60

Ridge Irons



MADE of $\frac{3}{8}$ x 2-inch galvanized bar steel and furnished complete with pin No. 9488, all wood top with standard 1-inch threading, as listed on page 388.

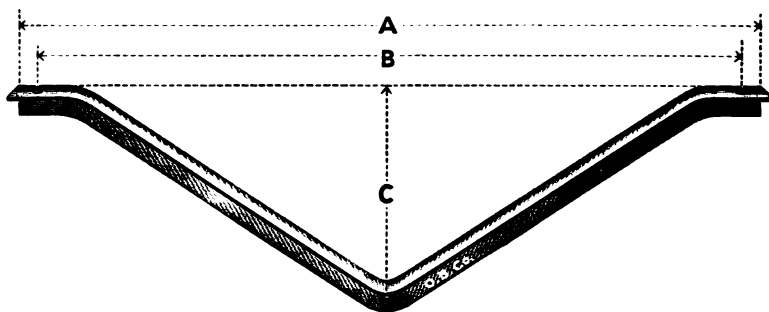
Height, Ridge Iron, 7 inches; height, overall, 12 inches.

Separation between legs, 6 inches; diameter of holes, $\frac{7}{8}$ inch.

Code Word
Habitacle.

No. 9926—Ridge Iron with Pin List per 100
\$59 40

Angle Iron Cross Arm Braces

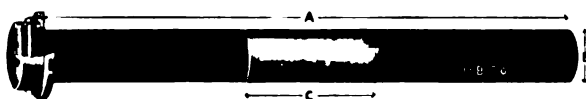


WE are in position to furnish Angle Iron Cross Arm Braces in accordance with specifications. When writing please give dimensions, A, B and C, as indicated in the above illustration and state size of angle iron desired.

Strain Pins



No. 9559—9934



No. 9562—9935

DESIGNED for use with Porcelain Strain Insulators shown on pages 326 to 332.

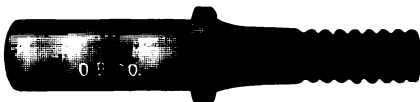
Wood pins are made of selected hickory and treated with varnish.

Metal Pins are made of Steel Tubing and provided with a cap at top to cover holes in tubing and cross arm.

Metal pins are fitted with flexible fibre sleeves which act as a cushion between pin and porcelain insulator.

Code Word	No.	Material of Pin	Dimensions in Inches			List per 100
			A	B	C	
<i>Hackle.</i>	9559	Hickory	16	1½	..	\$39 60
<i>Hackney.</i>	9561	"	19	2	..	41 80
<i>Hackster.</i>	9934	"	22	2	..	41 80
<i>Hadder.</i>	9562	Steel Tubing	16	1.66	4	72 60
<i>Haddie.</i>	9564	" "	19	1.90	6	88 00
<i>Haddock.</i>	9935	" "	22	1.90	6	92 40

Malleable Iron Pin



THE length of the plain end below the shoulder is $3\frac{1}{2}$ inches, and $4\frac{1}{4}$ inches on the threaded part above shoulder.

Code Word
Captor.

No. 1250— $1\frac{1}{2}$ x $7\frac{1}{4}$ inch, threaded end 1 inch in diameter, plain \$31 90

List per 100

Forged Steel Pin

With Small Wood Top



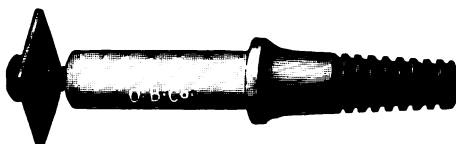
THIS Pin has a threaded and paraffined hard wood thimble on the top which is 1 inch in diameter. It is provided with a shoulder at the top, and a nut and washer at the bottom of the shank, to attach it rigidly to $3\frac{1}{4}$ x $4\frac{1}{4}$ -inch wooden cross arms.

Code Word
Caracole.

No. 4455—Pin $9\frac{1}{4}$ inches long, Shank $\frac{1}{2}$ inch in diameter, Wood Top $2\frac{3}{8}$ inches high, length under shoulder 5 inches \$7 40

List per 100

Drop Forged Iron Pin



THE length of the Pin is $7\frac{1}{4}$ inches; 3 inches on the plain end beneath the shoulder, and $4\frac{1}{4}$ inches on the threaded part above it. The threaded end is 1 inch in diameter. Other sizes furnished to specifications.

Code Word
Caramel.
Caravan.

No. 2112— $1\frac{1}{2}$ -inch Pin, with End Bolt and Washer, Plain finish \$81 40
2640— $1\frac{1}{2}$ " " without " " " " " " 77 00

List per 100

Wood Side Bracket



THESE Brackets are made from selected oak and are painted.
Length overall is 12 inches; No. 1252 is made from $1\frac{1}{2}$ -inch stock and No. 7687 from 2-inch stock.

Code Word	No.	List per 100
<i>Caraway.</i>	1252—Bracket, Regular, 1-inch Top.....	\$3 40
<i>Career.</i>	7687— “ Extra Heavy, 1-inch Top.....	4 00

Iron Side Brackets



No. 7688



No. 1254



No. 1253

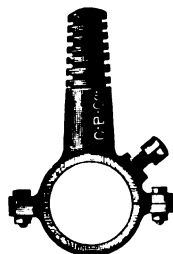
THESE Brackets have 1-inch standard insulator threading. The No. 7688 is intended for telephone or light feeder wires, and Nos. 1254 and 1253 will carry the largest sizes of feeder wire.

No. 1253 has a curved back designed for use on poles, while Nos. 7688 and 1254 have straight backs.

Slots in No. 7688 will take $\frac{1}{4}$ -inch lag screws; those in Nos. 1254 and 1253, $\frac{1}{2}$ -inch lag screws.

Code Word	No.	List per 100
<i>Caress.</i>	7688—Side Bracket, Small Size, Malleable Iron, Japanned.....	\$17 60
<i>Caribou.</i>	1254— “ “ Large “ “ “ “	44 00
<i>Carnival.</i>	1253— “ “ “ “ “ “ “	44 00

Pole Bracket Pin



IS used for attaching to pole brackets for carrying feeder wires or for inside work in rear of switchboards for carrying bus bars and heavy switching cables.

Pin has standard 1-inch insulator threading.

Code Word	No.	List per 100
<i>Carpal.</i>	1255—Pin for 1 $\frac{1}{4}$ -inch Pipe (1 $\frac{1}{8}$ inches outside diameter).....	\$39 60
<i>Carpel.</i>	1256— “ “ 1 $\frac{1}{2}$ “ “ (1 $\frac{3}{8}$ “ “ “ “).....	41 80
<i>Carter.</i>	1257— “ “ 2 “ “ (2 $\frac{1}{8}$ “ “ “ “).....	44 00

Cross Arm Braces



THE sizes listed below are regularly furnished with a hole at each end, $\frac{7}{16}$ inch and $\frac{9}{16}$ inch in diameter, respectively. They can be supplied with special sizes of holes to order.

Code Word	No.	List per 100
<i>Catacomb.</i>	2632—Length, overall 20 inches, 1 x $\frac{3}{8}$ -inch Iron, Sherardized.....	\$ 7 95
<i>Cataract.</i>	2633— “ “ 24 “ 1 $\frac{1}{2}$ x $\frac{1}{2}$ “ “ “ “	11 90
<i>Catagory.</i>	2635— “ “ 26 “ 1 $\frac{1}{2}$ x $\frac{1}{2}$ “ “ “ “	13 00
<i>Catfish.</i>	4454— “ “ 28 “ 1 $\frac{1}{2}$ x $\frac{1}{2}$ “ “ “ “	13 90

Lag Screws



Code Word	No.		List per 100
<i>Cerebral.</i>	7655— $\frac{3}{8}$ x2	inches, sherardized.	\$1 70
<i>Ceremony.</i>	7656— $\frac{3}{8}$ x2 $\frac{1}{2}$	"	1 90
<i>Chaser.</i>	4416— $\frac{3}{8}$ x3	"	2 05
<i>Chagrin.</i>	4417— $\frac{3}{8}$ x4	"	2 40
<i>Chaise.</i>	4418— $\frac{7}{8}$ x3	"	2 55
<i>Chalky.</i>	4419— $\frac{7}{8}$ x4	"	3 00
<i>Champion.</i>	7657— $\frac{1}{2}$ x2 $\frac{1}{2}$	"	2 85
<i>Chanter.</i>	4421— $\frac{1}{2}$ x3	"	3 10
<i>Chapel.</i>	7658— $\frac{1}{2}$ x3 $\frac{1}{2}$	"	3 35
<i>Chaperon.</i>	4422— $\frac{1}{2}$ x4	"	3 60
<i>Chapter.</i>	4423— $\frac{1}{2}$ x5	"	4 20
<i>Chariot.</i>	4424— $\frac{1}{2}$ x6	"	4 70

Standard sizes not listed above furnished to order.

Cross Arm Bolts

With Square Heads and Nuts



Code Word	No.		List per 100
<i>Mothen.</i>	11955— $\frac{5}{8}$ x10 inches, sherardized, with 4-inch threading.		\$13 40
<i>Mothered.</i>	11956— $\frac{5}{8}$ x11 " " " 4 " "		14 30
<i>Motherly.</i>	11957— $\frac{5}{8}$ x12 " " " 4 " "		15 30
<i>Motility.</i>	11958— $\frac{5}{8}$ x14 " " " 6 " "		17 15

Standard sizes not listed above furnished to order.

Common Carriage Bolts

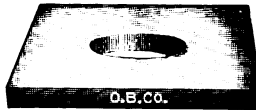


THE length of thread on Carriage Bolts is approximately three times the diameter of the bolts.

Code Word	No.		List per 100
<i>Clouding.</i>	4439—	½x4 inches, sherardized	\$1 70
<i>Clover.</i>	4440—	½x5 “ ”	1 90
<i>Clubbed.</i>	4445—	½x4 “ ”	2 80
<i>Clucking.</i>	4446—	½x5 “ ”	3 20

Standard sizes not listed above furnished to order.

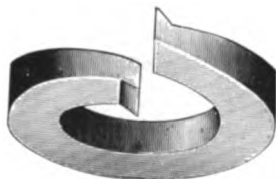
Square Iron Washers



Code Word	No.	Size in Inches	To Fit Bolt	Finish	List per 1000
<i>Codifier.</i> <i>Coercion.</i>	9551 7672	2 x 2 x $\frac{1}{4}$ $2\frac{1}{4}$ x $2\frac{1}{4}$ x $\frac{1}{4}$	$\frac{1}{2}$ -inch "	Sherardized "	\$14 10 24 45

Standard sizes not listed above furnished to order.

Positive Lock Washers



THE body of this Washer carries the load of compression, and the spring is not affected by continued use. When subject to vibration or jarring, the engaging points on the Washer embed themselves more firmly in the surfaces against which they bear and form a positive lock. It is reversible and does not injure the bolt or other parts with which it is assembled. Its utility is not impaired by using many times. Washers are galvanized.

Code Word	No.	Diameter of Bolt	Size of Steel		List per 1000
			Thickness	Width	
<i>Cogitate.</i>	9541	$\frac{3}{4}$ inch	$\frac{1}{8}$ inch	$\frac{3}{4}$ inch	\$ 8 60
<i>Cohesion.</i>	5035	$\frac{1}{2}$ "	$\frac{1}{8}$ "	$\frac{1}{2}$ "	8 15
<i>Coinage.</i>	5036	$\frac{1}{2}$ "	$\frac{1}{8}$ "	$\frac{1}{2}$ "	11 00
<i>Corner.</i>	5037	$\frac{1}{2}$ "	$\frac{1}{8}$ "	$\frac{1}{2}$ "	11 45
<i>Coldish.</i>	5039	$\frac{1}{2}$ "	$\frac{1}{8}$ "	$\frac{1}{2}$ "	13 20
<i>Collapse.</i>	5040	1 "	$\frac{1}{8}$ "	1 "	17 80
<i>Molley.</i>	11683	1 $\frac{1}{2}$ "	$\frac{1}{8}$ "	1 $\frac{1}{2}$ "	22 40

Round Iron Washers

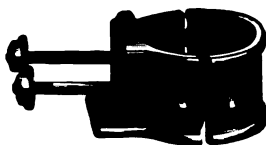


Code Word	No.	Outside Diameter	*To Fit Cross Arm Bolt	Finish	List per 1000
<i>Colonize.</i>	4408	1 $\frac{1}{2}$ inches	$\frac{1}{2}$ inch	Sherardized	\$ 4 75
<i>Colossus.</i>	4410	1 $\frac{1}{2}$ "	$\frac{1}{2}$ "	"	10 70

*Note:—No. 4408 will fit $\frac{1}{2}$ -inch common carriage bolts and No. 4410 will fit $\frac{3}{4}$ -inch common carriage bolts.

Wood Cross Arm Supports

For Iron Poles



USED for attaching standard size wood cross arms to iron poles. The cross arms are secured to the Supports by the two $\frac{1}{2}$ -inch bolts shown, which pass through them and clamp them in place by means of a nut and washer on their outer ends. These Supports are made of malleable iron, jappaned.

Code Word	No.	List per 100
<i>Combater.</i>	2641—Single Support for 4-in. Pole ($4\frac{1}{2}$ in. outside diameter).....	\$143 00
<i>Combing.</i>	2643— “ “ “ 5 “ ($5\frac{1}{8}$ “ “).....	154 00
<i>Combust.</i>	2644— “ “ “ 6 “ ($6\frac{1}{8}$ “ “).....	193 60

In ordering Cross Arm Supports observe that the Pole diameters as listed are “Pipe Measurements.”

Anchor or Guy Rods

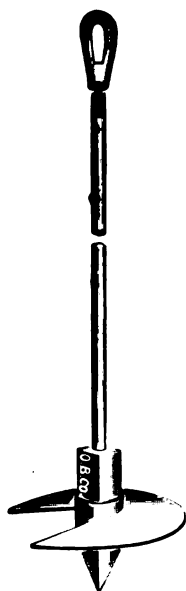


THESE Rods are furnished complete with nut and square iron washer, size 4 x 4 x $\frac{3}{16}$ inches.

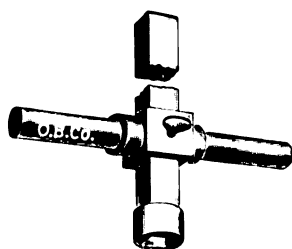
Code Word	No.	List per 100
<i>Comedian.</i>	4222—Anchor Rod, $\frac{5}{8}$ inch x 6 feet, Plain.....	\$ 47 30
<i>Comedy.</i>	4223— “ “ $\frac{5}{8}$ “ x 6 “ Galvanized.....	66 00
<i>Cometary.</i>	4224— “ “ $\frac{5}{8}$ “ x 8 “ Plain.....	59 40
<i>Comfort.</i>	4225— “ “ $\frac{5}{8}$ “ x 8 “ Galvanized.....	82 50
<i>Commatic.</i>	4226— “ “ $\frac{3}{4}$ “ x 6 “ Plain.....	62 70
<i>Commix.</i>	4227— “ “ $\frac{3}{4}$ “ x 6 “ Galvanized.....	90 20
<i>Commode.</i>	4228— “ “ $\frac{3}{4}$ “ x 8 “ Plain.....	79 20
<i>Communal.</i>	4229— “ “ $\frac{3}{4}$ “ x 8 “ Galvanized.....	112 75
<i>Compact.</i>	7565— “ “ 1 “ x10 “ Plain.....	181 50
<i>Comparer.</i>	7566— “ “ 1 “ x10 “ Galvanized.....	255 20

Stombaugh Guy Anchor

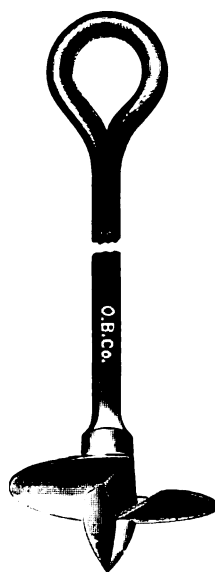
Type B Improved



5, 6 and 7-Inch
Anchor



Wrench
for Setting 5, 6 and 7-Inch Anchors



8-Inch Anchor

IN installing the smaller sizes of this Anchor up to 8 inches, it is necessary to use a wrench, as the cross-section of the rods is not sufficiently great to stand the twisting strain. With the larger sizes an iron or wood bar may be placed through the eye of the Anchor, to use as a handle in screwing it into the ground. Anchors are regularly furnished plain but can be galvanized to order.

Code Word	No.	Diameter of Blade	Length of Rod	Size of Rod	Weight Each in lbs.	List per 100
<i>Cordial.</i>	9475	5 inches	6 feet	$\frac{1}{2}$ -in. Round	6 $\frac{1}{2}$	\$164 45
<i>Cornage.</i>	9476	6 "	6 "	$\frac{3}{8}$ " "	10	321 75
<i>Corner.</i>	9477	7 "	6 "	$\frac{3}{4}$ " "	12	594 00
<i>Cornice.</i>	9478	8 "	6 "	1 $\frac{1}{8}$ " Square	38	990 00
<i>Corolla.</i>	9481	Wrench for 5 and 6-inch Anchors			18	729 50
<i>Corona.</i>	9482	Wrench for 7-inch Anchors			20	858 00

Miller Guy Anchors

Improved Design

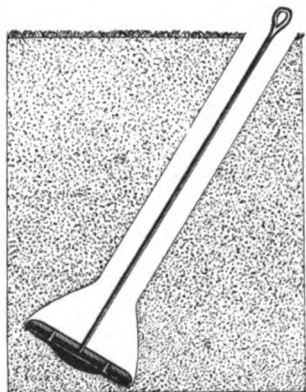


Fig. 1—Anchor ready for Tamping
Note new Design of Blade

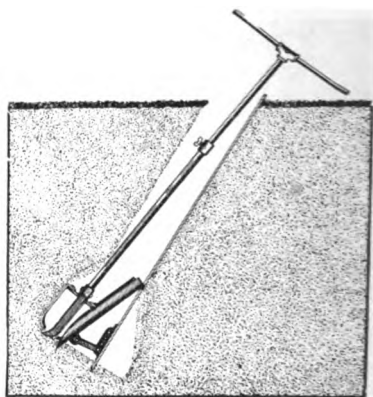


Fig. 2—Showing how Auger and Deflector
are used to enlarge bottom of hole

TO install the Miller Anchor, bore down with the proper sized auger to the depth you wish to set the Anchor, then put in the Deflector (see Fig. 2) and push down hard so the points will go well into the ground; next put in the Auger again and bore down just as deep as the original hole. Turn the Deflector one-half way around and bore out the opposite side and then set the Anchor as shown in Fig. 1.

Anchors set in this way press against the solid ground and will not creep. The Anchors are large enough to break the rods they are fitted with before pulling up. Enlarging the bottom of the hole is done in 5 to 10 minutes.

Regularly furnished japanned finish.

Code Word	No.	Size of Anchor, Inches	Area of Anchor	Diameter of Rod, Inches	Length of Rod, Feet	List Each
<i>Coroner.</i>	8592	10x5	Equals a 7-inch Circle	$\frac{1}{2}$	6	\$1 30
<i>Corporal.</i>	8593	13x6	" 9 " "	$\frac{3}{4}$	7	1 75
<i>Corrupt.</i>	8594	16x7	" 12 " "	$\frac{7}{8}$	7	2 75
<i>Cosmetic.</i>	8595	19x8	" 14 " "	1	7½	4 95

Tools for installing these Anchors are listed on the following page.

Miller Guy Anchor Tools

THE small Standard Auger has a 7-foot stem and is suitable for installing the No. 8592 Anchor, and the large Standard has a 9-foot stem and is used for the Nos. 8593 to 8595 Anchors.

To insure a satisfactory installation, a Miller Auger and a Deflector, No. 10474, should be used. It is adjustable and will set Nos. 8593, 8594 and 8595 Anchors, but is not needed with No. 8592 Anchor. When an Auger is purchased, the Deflector is furnished F. O. C. With the larger sizes of anchors, a Tamping Bar, No. 9506, should be purchased.

Code Word	No.	List Each
<i>Costume.</i>	8597—Small Standard Auger, for setting Anchor No. 8592.....	\$5 50
<i>Cottage.</i>	8598—Large “ “ “ “ “ “ 8593-8595....	6 60
<i>Courage.</i>	9506—Hollow Stem Tamping Bar, 1½ in. x 9 feet, with Cutter and Round Tamping Heads.....	4 40
<i>Flinders.</i>	10474—Auger Deflector	6 60

Harpoon Guy Anchor



Anchor Closed



Anchor Open

THIS Anchor consists of an iron rod 5 feet long and 1 inch square with four wings at the lower end. It is installed by driving the rod its full length into the ground with a sledge hammer, no digging being necessary.

The guy wire is then attached to the ring in the end of the rod, and as the guy is tightened the wings of the Anchor will spread and set the Anchor.

Code Word	No.	List Each
<i>Crackle.</i>	10456—Harpoon Guy Anchor, Black Enamel Finish.....	\$3 10
<i>Craftily.</i>	10457— “ “ “ Galvanized.....	3 60

Mechanical Feeder Wire Strain Clamp



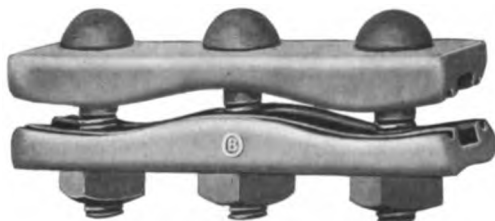
DESIGNED for the purpose of reducing the number of Clamps necessary to cover the range of sizes of feeder wire usually required in feeder systems, as well as to have a higher holding power than those generally used in the past.

Each half has spiral grooves corresponding to the arrangement of the cable strands and arranged for cable whose outer strands are wound right hand, but in case of the outer strands being wound left hand the number of friction points is so great that ample holding strength is insured without tearing of the strands.

Made of malleable iron, sherardized. Hole in eye is $\frac{1}{8}$ inch in diameter.

Code Word	No.	List per 100
<i>Fluster.</i>	10571—Clamp for No. 4-0 B. & S. Solid to 400,000 C. M. Stranded Cable, inclusive.....	\$77 00
<i>Fluted.</i>	10572—Clamp for 500,000 to 1,000,000 C. M. Stranded Cable, inclusive	99 00

Schaper Guy Wire Clamp

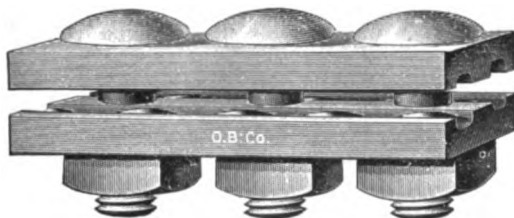


OF a heavy design of forged steel, and stronger than the ordinary type of three-bolt clamp as the wave form of groove for the wire gives greater resistance against slipping than a flat groove. It is intended for use on high strength cables in heavy guy work, catenary construction, etc. Length, $5\frac{1}{2}$ inches.

Code Word
Herbage.

No. List per 100
10716—Clamp, Galvanized, for $\frac{3}{4}$, $\frac{1}{2}$ and $\frac{1}{4}$ -inch Strand \$42 35

Guy Wire Clamp



Made of Rolled Steel, Galvanized.

Code Word
Conquest.
Conserve.

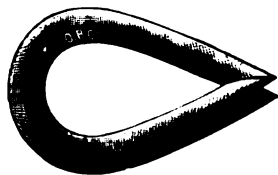
No. List per 100
3205—Two Bolt Clamp for $\frac{1}{4}$ to $\frac{7}{16}$ -inch Strand, Length 3 in.. \$18 15
3206—Three " " " " $\frac{1}{4}$ to $\frac{7}{16}$ " " " 4 " 23 10

Wire Rope Clip



Code Word	No.	For Size Strand, Inches	Finish	List per 100	Code Word	No.	For Size Strand, Inches	Finish	List per 100
<i>Console.</i>	10267	$\frac{1}{8}$ & $\frac{1}{4}$	Galv.	\$ 7 50	<i>Fogless.</i>	4217	$\frac{1}{8}$	Jap.	\$ 8 60
<i>Consort.</i>	4216	$\frac{1}{8}$ & $\frac{1}{4}$	Jap.	7 05	<i>Foliage.</i>	10575	$\frac{1}{8}$	Galv.	13 90
<i>Constant.</i>	10573	$\frac{1}{8}$	Galv.	9 25	<i>Foliolate.</i>	10576	$\frac{1}{8}$	Jap.	10 60
<i>Content.</i>	10574	$\frac{1}{8}$	Jap.	7 70	<i>Follower.</i>	10269	$\frac{1}{2}$	Galv.	11 70
<i>Contuse.</i>	10268	$\frac{1}{8}$	Galv.	11 70	<i>Fondle.</i>	4218	$\frac{1}{2}$	Jap.	11 00

Steel Wire Strand Thimble



Furnished with ends open for inserting in eyes of anchor rods, etc. When installed, ends are easily closed as shown.

Code Word	No.	List per 100
<i>Convoy.</i>	4219—Thimble for $\frac{1}{8}$ to $\frac{1}{4}$ -inch Strand, Galvanized	\$ 4 95
<i>Cooler.</i>	7812— " " " " " "	5 65
<i>Copier.</i>	4220— " " " " " "	6 35
<i>Copious.</i>	4221— " " " " " "	7 75

Galvanized Steel Wire Strand



Regular Grade—Single Galvanized

Code Word	No.	7 Wires	Diameter in Inches	Weight in Pounds per 100 Feet	Approximate Breaking Strain in Pounds	List per 100 Feet
<i>Craggy.</i>	1190	No. 15	1-4	13	2300	\$1 75
<i>Cranium.</i>	1191	" 12	5-16	22	3800	2 25
<i>Crater.</i>	1192	" 11	3-8	30	5000	3 50
<i>Create.</i>	2572	" 10	7-16	40	6500	4 50
<i>Credence.</i>	2573	" 8	1-2	52	8500	5 50

Regular Grade—Extra Galvanized

Code Word	No.	7 Wires	Diameter in Inches	Weight in Pounds per 100 Feet	Approximate Breaking Strain in Pounds	List per 100 Feet
<i>Crescent.</i>	7807	No. 15	1-4	13	2300	\$1 75
<i>Cribbage.</i>	7808	" 12	5-16	22	3800	2 25
<i>Crimson.</i>	7809	" 11	3-8	30	5000	3 50
<i>Cringe.</i>	7810	" 10	7-16	40	6500	4 50
<i>Critical.</i>	7811	" 8	1-2	52	8500	5 50

Siemens-Martin—Extra Galvanized

Code Word	No.	7 Wires	Diameter in Inches	Weight in Pounds per 100 Feet	Approximate Breaking Strain in Pounds	List per 100 Feet
<i>Crochet.</i>	10280	No. 15	1-4	13	3050	\$1 00
<i>Crowned.</i>	10281	" 12	5-16	22	4860	1 48
<i>Cruelly.</i>	10282	" 11	3-8	30	6800	1 80
<i>Cruiser.</i>	10283	" 10	7-16	40	9000	2 30
<i>Crusade.</i>	10284	" 8	1-2	52	11000	2 80

High Strength—Extra Galvanized

Code Word	No.	7 Wires	Diameter in Inches	Weight in Pounds per 100 Feet	Approximate Breaking Strain in Pounds	List per 100 Feet
<i>Isothermal.</i>	10285	No. 15	1-4	13	5100	\$1 50
<i>Isothere.</i>	10286	" 12	5-16	22	8100	2 10
<i>Isotherm.</i>	10287	" 11	3-8	30	11500	2 70
<i>Isotonic.</i>	10288	" 10	7-16	40	15000	3 45
<i>Isotropic.</i>	10289	" 8	1-2	52	18000	3 95

Note: Above are Manufacturer's List Prices in effect February, 1914.

Ohio Incandescent Lamps

Carbon Filament—Licensed Label



Edison Base

Code Word	No.	Watts	Approximate Candle Power	Voltage	No. in Std. Pkg.	List per 100
<i>Motmot.</i>	11959	60	16	110	200	\$30 80
<i>Motorial.</i>	11960	60	16	120	200	30 80
<i>Mottle.</i>	11961	60	16	130	200	30 80
<i>Mottoed.</i>	11962	60	16	220	200	35 20
<i>Mouffon.</i>	11963	60	16	250	200	35 20
<i>Moulinet.</i>	11964	60	16	260	200	35 20
<i>Mountain.</i>	11965	60	16	275	200	35 20
<i>Mourner.</i>	11966	120	32	110	100	46 20
<i>Mournful.</i>	11967	120	32	120	100	46 20
<i>Mousekin.</i>	11968	120	32	130	100	46 20
<i>Mouselc.</i>	11969	120	32	220	100	61 60
<i>Moutan.</i>	11970	120	32	250	100	61 60
<i>Mouthed.</i>	11971	120	32	260	100	61 60
<i>Mouthful.</i>	11972	120	32	275	100	61 60

Lamps for other voltages and candle powers than those listed above can be furnished to order.

Standard packages may be made up from assorted candle powers and voltages.

Lamp Sockets

250 Volts



No. 1591



No. 1588



No. 9722

Code Word	No.	List per 100
<i>Curfew.</i>	1591— Keyless Socket, Edison Base, $\frac{1}{8}$ -inch Cap.....	\$40 70
<i>Curtail.</i>	1588—Key " " " " "	44 00
<i>Custody.</i>	9722— " Wall " " "	59 40

All the above Sockets can be furnished with T. H. Base when so ordered.

Packed 10 in a paper box.

Weatherproof Sockets



No. 9573



No. 2879



No. 2876

Code Word	No.	List per 100
<i>Cuticle.</i>	2879—Mica Socket, Edison Base.....	\$29 70
<i>Cyclone.</i>	9573—Porcelain Petticoat Socket, Edison Base.....	48 40
<i>Dabbler.</i>	2876— " Socket, Edison Base.....	18 70

Porcelain Receptacle

250 Volt



Code Word
Daffodil.

No.	List per 100
1603—Cleat Receptacle, Edison Base.....	\$20 35

Little Gem Rosettes

Fusible



No. 8301



No. 8302

Code Word
Daftness.
Dagger.

No.	List per 100
8301—Porcelain Rosette, Cleat Style.....	\$26 40
8302— “ “ Concealed Style.....	26 40

Porcelain Attachment Plug

Fusible

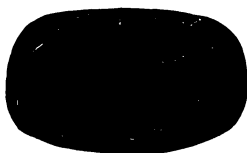


Code Word
Dainty.

No.	List per 100
6959—Attachment Plug, Edison Base, Fusible.....	\$29 70

Lamp Cord

Cotton Covered



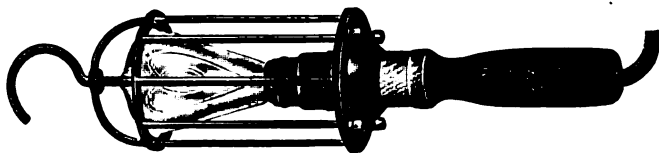
Code Word	No.	List per 1000 Feet
<i>Damask.</i>	9576—National Code Std. No. 14 B. & S. $\frac{1}{2}$ -in. Rubber Insulation	\$49 15
<i>Dampen.</i>	9577— " " " " 16 " $\frac{1}{2}$ " " "	33 00
<i>Damson.</i>	9578— " " " " 18 " $\frac{1}{2}$ " " "	25 65

Socket Bushing



Code Word	No.	List per 100
<i>Danger.</i>	4780—Bushing, Hard Rubber, $\frac{1}{2}$ inch.....	\$0 80

Portable Lamp Guard



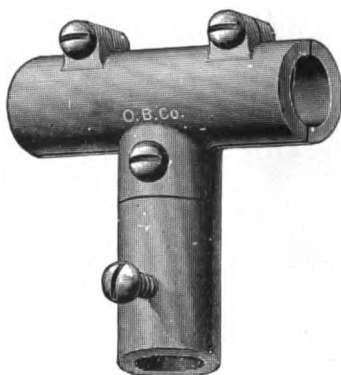
THIS Lamp Guard is fast coming into general use in carbarn pits, railroad yards, mines, etc.

It consists of a strong but light wire cage which is fastened to a wood handle by means of a bayonet-locking device, and the cage is provided with a hook of such size and shape as to enable the user to hang the lamp upon any available support, thus leaving both hands free to work.

The Lamp Guard as regularly furnished is copper plated

Code Word	No.	List per 100
<i>Dareful.</i>	9514—Lamp Guard with Edison Base Socket.....	\$396 00

Tee Wire Connector

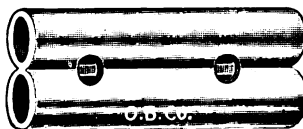


WHEN ordering Connectors for use with stranded wire or for different sizes of main and branch wires, either solid or stranded, always give sizes and diameters of wires.

As regularly furnished, connectors are drilled same size for both main and branch wires.

Code Word	No.					List per 100
<i>Darken.</i>	4300—	Connector for No.	6 B. & S. Solid Wires			\$41 00
<i>Dashing.</i>	4301—	"	4	"	"	46 20
<i>Datable.</i>	4302—	"	2	"	"	55 00
<i>Dative.</i>	2592—	"	0	"	"	57 20
<i>Daunter.</i>	2593—	"	2-0	"	"	57 20
<i>Deafen.</i>	2594—	"	3-0	"	"	63 80
<i>Debate.</i>	2595—	"	4-0	"	"	63 80

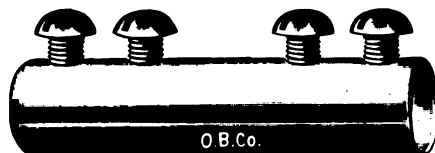
Soldered Connector



THE ends of the wire are passed through the Connector, headed over and then soldered into it.

Code Word	No.					List per 100
<i>Decade.</i>	1206—	Connector for No.	0 B. & S. Wire, length 2½ inches			\$44 00
<i>Decanter.</i>	1207—	"	2-0	"	"	50 60
<i>Decimal.</i>	1208—	"	3-0	"	"	55 00
<i>Declaim.</i>	1209—	"	4-0	"	"	55 00

Two-Way Wire Connector



Nos. 1214—4305

With Round-Head Screws

Code Word	No.	List per 100
<i>Dialect.</i>	1214—Connector for No. 6 B. & S. Solid Wire, length 2 inches...	\$ 9 90
<i>Dialogue.</i>	1213—“ “ “ 4 “ “ “ “ 2 “	... 11 00
<i>Diamond.</i>	1212—“ “ “ 2 “ “ “ “ 2 “	... 12 30
<i>Diction.</i>	1211—“ “ “ 0 “ “ “ “ 2 “	... 13 20
<i>Digress.</i>	4303—“ “ “ 2-0 “ “ “ “ 2 “	... 14 30
<i>Dilate.</i>	4304—“ “ “ 3-0 “ “ “ “ 2 “	... 16 50
<i>Diluent.</i>	4305—“ “ “ 4-0 “ “ “ “ 2 “	... 17 60

With Square-Head Screws

Code Word	No.	List per 100
<i>Diluter.</i>	4309—Connector for No. 0 B. & S. Solid Wire, length 2 inches...	\$13 20
<i>Dimity.</i>	4310—“ “ “ 2-0 “ “ “ “ 2 “	... 14 85
<i>Dioxide.</i>	4311—“ “ “ 3-0 “ “ “ “ 2 “	... 16 50
<i>Diploma.</i>	4312—“ “ “ 4-0 “ “ “ “ 2 “	... 17 60

Twist Connectors

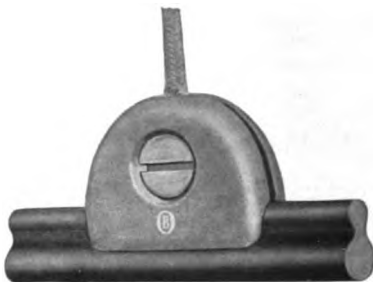
For Hard Drawn Copper Wire



Telephone Sizes

Code Word	No.	List per 100
<i>Direful.</i>	4297—Connector for No. 10 B. & S. Solid Wire, length 4½ inches...	\$5 40
<i>Disadorn.</i>	4298—“ “ “ 12 “ “ “ “ 4½ “	... 4 85
<i>Disarray.</i>	4299—“ “ “ 14 “ “ “ “ 4 “	... 4 40

Current Tap



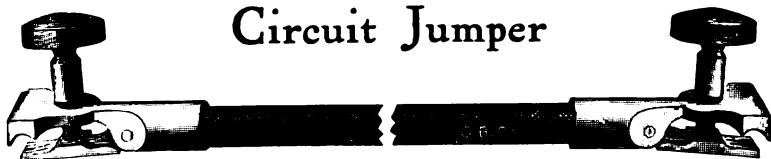
USED for attaching lighting or other circuits, carrying small current, to the trolley wire in mines. It is composed of sherardized malleable iron castings held together with a flat head brass screw which causes the jaws to grip both wires at the same time.

Will fit any ordinary lighting circuit wire and 2-0, 3-0 and 4-0 grooved and Fig. 8 trolley wires.

Castings offer no obstruction to the trolley wheel.

Code Word	No.		List per 100
Lingence.	11160—	Current Tap, Malleable Iron, Sherardized.....	\$13 20

Circuit Jumper



OFFERS a convenient means of making a temporary electrical connection between two wires.

The insulated cable is equal to No. 4-0 B. & S. gauge and is 24 inches long; to both ends of this are attached hinged brass clamps, with insulated handles, which will fit on wires from Nos. 0 to 4-0 B. & S. gauge.

Code Word	No.		List Each
Conquer.	2591—	Circuit Jumper.....	\$4 40

Cutting Machine Connector



USED for connecting cutting machines and other apparatus to the trolley wire. May be quickly put in place by slipping over the wire, either from above or below.

The machine cable is soldered into the connector, the brass sleeve fitting over the insulation of the cable and preventing sharp bending which would cause it to break, if unprotected, at the point where it entered the connector.

Jaws and springs are made of phosphor bronze. Will fit any size of trolley wire. Shank regularly drilled $\frac{5}{16}$ inch for No. 4 stranded cable. Length overall, $7\frac{1}{2}$ inches.

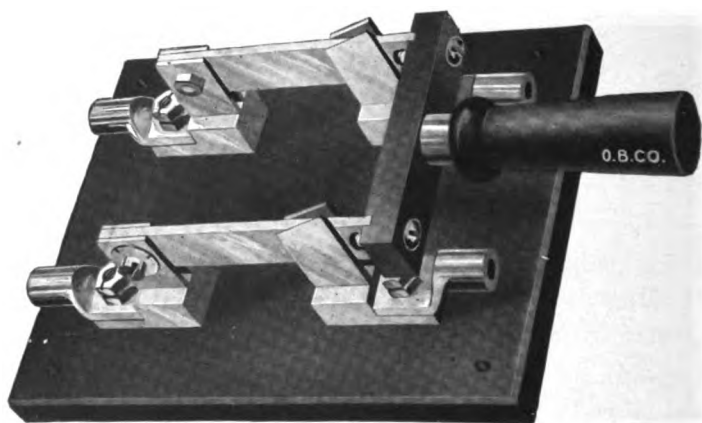
Code Word
Moveless.

No. 11433—Connector for 0 to 4-0 Round, Fig. 8 and Grooved Trolley
Wires.....**\$104 50**

List per 100

Premier Knife Switches

For Circuits of 110—600 Volts



THE Premier Knife Switch is a strictly high grade switch in every respect, and similar in construction and appearance to the higher priced switches now on the market. It is thoroughly well made throughout, the blades and jaws being of cold rolled copper of generous proportions, and the base of selected slate with a black japanned finish. The Switch is neat in appearance, and in the "polished" form is suitable for the finest switchboard work. It is made in accordance with the requirements of the National Code. The Switches with fuse connections are regularly furnished for National Electrical Code Standard enclosed fuses.

See following page for lists.

Premier Knife Switches

For 110-600 Volt Circuits

Without Fuse Connections

Single Pole—Single Throw

Code Word	No.	Capacity in Amperes	Voltage	List Each
<i>Declinal.</i>	8451	25	110-250	\$ 1 00
<i>Decorum.</i>	8452	50	110-250	1 55
<i>Decoy.</i>	8454	100	110-250	2 75
<i>Dedicate.</i>	8456	200	110-250	4 65
<i>Deepen.</i>	8457	300	110-250	6 70
<i>Defame.</i>	8458	400	110-250	9 80
<i>Default.</i>	8460	600	110-250	13 65
<i>Defender.</i>	8511	25	350-600	1 45
<i>Dejorce.</i>	8512	50	350-600	1 90
<i>Deftness.</i>	8514	100	350-600	3 55
<i>Delation.</i>	8516	200	350-600	5 50
<i>Delusion.</i>	8517	300	350-600	8 25
<i>Demerit.</i>	8518	400	350-600	12 45
<i>Denizen.</i>	8520	600	350-600	17 05

Double Pole—Single Throw

Code Word	No.	Capacity in Amperes	Voltage	List Each
<i>Denote.</i>	8481	25	110-250	\$ 1 20
<i>Deplore.</i>	8482	50	110-250	2 22
<i>Depolish.</i>	8484	100	110-250	4 10
<i>Deponent.</i>	8486	200	110-250	6 95
<i>Deport.</i>	8487	300	110-250	9 80
<i>Deranger.</i>	8488	400	110-250	14 85
<i>Derelict.</i>	8490	600	110-250	20 15
<i>Deride.</i>	8541	25	350-600	1 75
<i>Derision.</i>	8542	50	350-600	2 75
<i>Derogate.</i>	8544	100	350-600	5 20
<i>Descend.</i>	8546	200	350-600	8 80
<i>Deserter.</i>	8547	300	350-600	12 35
<i>Desition.</i>	8548	400	350-600	18 50
<i>Desolate.</i>	8550	600	350-600	24 95

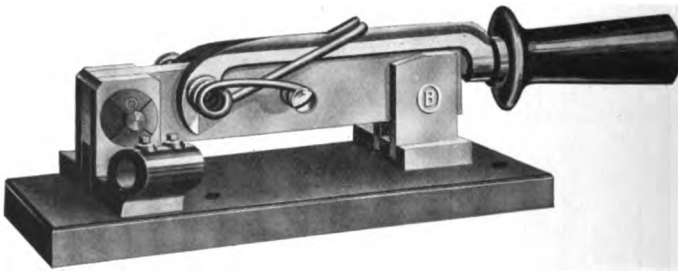
Premier Knife Switches can also be furnished with a capacity in amperes of 75, 500, 800, 1000, 1250, 1500 and 2000.

Any of the above Switches can be furnished with National Code Standard Fuse Holders, if desired, at an advanced price

Standard Quick Break Switches

Patented

For Circuits of 110—600 Volts



ARE well adapted for railway and mine circuits where a quick, wide break is necessary.

Blades and jaws are of hard, cold rolled copper of ample cross section for rated capacities.

Flared handle protects hand.

Base is selected slate. Metal parts have plain finish.

Front connections.

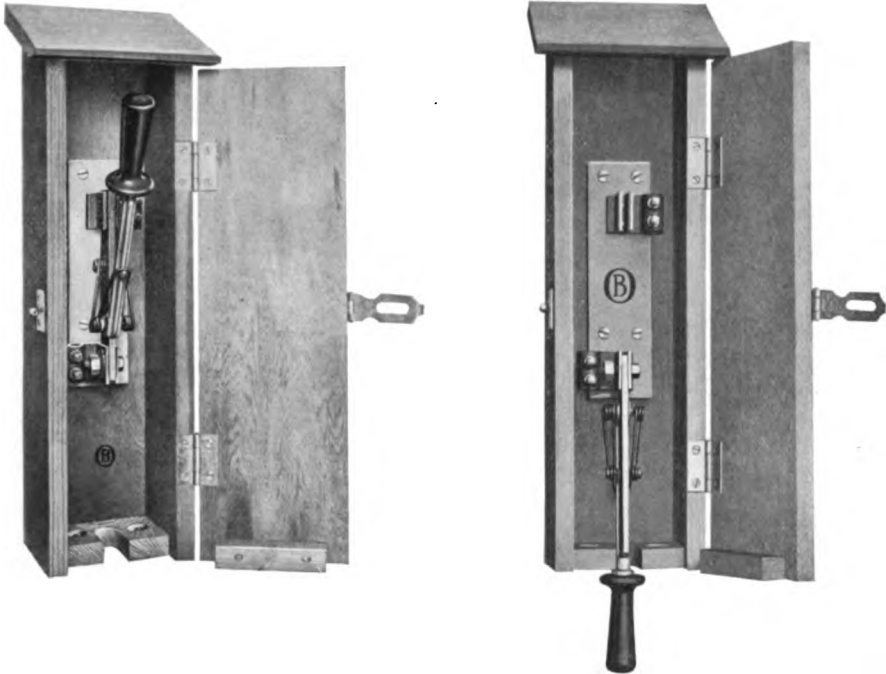
Single Pole

Code Word	No.							List Each
<i>Despend.</i>	7826—	100 Amperes, plain finish, not fused,	$\frac{1}{2}$ -inch connections					\$ 4 20
<i>Despoil.</i>	7827—	200 " " " " " "	$\frac{1}{2}$ " "					4 40
<i>Despot.</i>	7828—	300 " " " " " "	$\frac{3}{4}$ " "					5 50
<i>Destine.</i>	7829—	400 " " " " " "	$\frac{3}{4}$ " "					6 05
<i>Desume.</i>	7830—	600 " " " " " "	$1\frac{1}{8}$ " "					8 80
<i>Detent.</i>	7831—	800 " " " " " "	$1\frac{1}{8}$ " "					12 65
<i>Detract.</i>	7832—	1000 " " " " " "	$1\frac{1}{8}$ " "					14 30

All prices are for "Plain" finish; for Polished finish, add 30 per cent. to above list prices.

Line Section Switch

For 110-750 Volts—Patented



SWITCH is Quick Break type, single pole, mounted on slate base and enclosed in a cypress wood box with hinged door which may be closed and fastened when switch is open or closed.

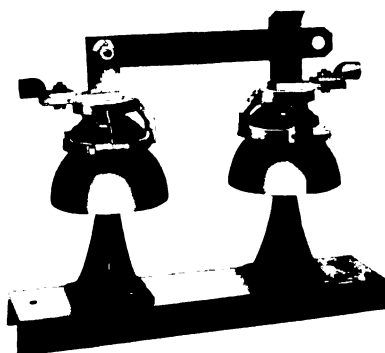
Insulated handle only projects below bottom of box when switch is open, thus preventing inexperienced persons from coming into contact with live parts.

Front connections, not fused.

Code Word	No.	Capacity, Amperes	Size of Connections in Inches	Height of Box, Inches	List Each
<i>Knacker.</i>	11359	100	$\frac{1}{2}$	23	\$ 6 60
<i>Knapsack.</i>	11360	200	$\frac{1}{2}$	23	6 85
<i>Knavery.</i>	11361	300	$\frac{3}{4}$	23	7 70
<i>Knicker.</i>	11362	400	$\frac{3}{4}$	23	8 80
<i>Knighly.</i>	11363	600	$\frac{1}{2}$	25 $\frac{1}{2}$	12 10
<i>Knitback.</i>	11364	800	1 $\frac{1}{4}$	28	17 60
<i>Knitter.</i>	11365	1,000	1 $\frac{1}{2}$	28	22 00

Line Section Switch

For Circuits of 1200 to 6600 Volts



SWITCH is mounted on porcelain insulators cemented to malleable iron base pins which are in turn bolted to channel iron base.

Channel iron is provided with two $\frac{7}{16}$ -inch holes, $15\frac{1}{2}$ inches apart for mounting on side of pole. If desired, black enameled slate base can be furnished without extra charge.

Height overall with switch open, 22 inches; with switch closed, 13 inches. Blade is $\frac{1}{4} \times 1\frac{1}{2} \times 12$ inches and is provided with a $\frac{3}{4}$ -inch hole for disconnecting hook.

All iron parts are sherardized or galvanized. Copper parts are bright dipped and lacquered.

Code Word
Mowing.

No.
11598—Switch complete, 300 amperes, not fused, $\frac{3}{4}$ -inch
connections.

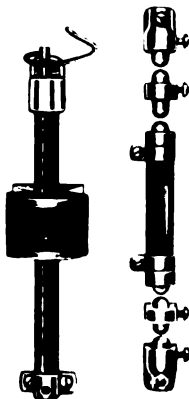
List Each

\$17 60

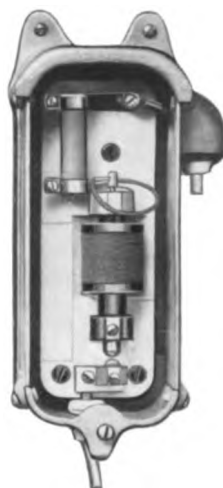
Garton-Daniels Lightning Arresters



No. 9730



No. 9750



No. 9725

CONSIST of a resistance, one or more fixed air gaps and an air gap opened by the action of a magnet operated by the current flowing to ground, all connected in series.

Made in four styles—Station Type, Car Type, Iron Covered Pole Type and Wood Covered Pole Type.

The Station Type has no cover and the metal parts are highly polished and lacquered.

The metal parts of Pole and Car Arresters have a dipped finish.

The leads for the Pole Type are brought out of the box through porcelain bushings to provide ample insulation.

The Type CE-2 Arresters are connected two or more in series for voltages exceeding 2,500 and the Type F-2 Arresters are similarly connected for voltages exceeding 5,000.

For voltages above 15,000, Station Type Arresters only are furnished and if it is desired to mount on poles, special housings must be provided by the purchaser.

Garton-Daniels Lightning Arresters

Continued

For Lighting and Power Circuits
Direct or Alternating Current

Code Word	No.	Type	Voltage	Description	Dimensions in Inches	Net Weight in Lbs.	List Each
<i>Dotage.</i>	9724	DF	Up to 350	Station Type	8½x3x3	2½	\$6 40
<i>Dowager.</i>	9725	DF	Up to 350	Iron Covered	12½x6x4	11½	7 80
<i>Downtrod.</i>	9726	DF	Up to 350	Wood Covered	13½x7x6	6½	6 40

For Railway Circuits
Direct Current

Code Word	No.	Type	Voltage	Description	Dimensions in Inches	Net Weight in Lbs.	List Each
<i>Downward.</i>	9727	EG	350 to 750	Station Type	9½x 3½x 3	4½	\$ 7 00
<i>Mowyer.</i>	11534	EG	350 to 750	Wood Car	14 x 7 x 6½	8½	7 00
<i>Dramatic.</i>	9728	EG	350 to 750	Iron Covered	13½x 6½x 4½	13½	8 00
<i>Drapery.</i>	9730	EG	350 to 750	Wood Covered	14½x 7 x 6½	8½	7 00
<i>Mucamide.</i>	11530	EH	750 to 1,300	Station Type	19½x 4 x 3½	11½	14 00
<i>Mucedin.</i>	11531	EH	750 to 1,300	Wood Car	21½x10½x 6½	21	14 00
<i>Mucific.</i>	11532	EH	750 to 1,300	Wood Covered	25½x 8½x 7½	21½	14 00

For Railway and Power Circuits
Alternating Current

Code Word	No.	Type	Voltage	Description	Dimensions in Inches	Net Weight in Lbs.	List Each
<i>Drayman.</i>	9750	CE-2	1,200 to 2,500	Station Type	11 x 4½x 3½	8	\$ 8 80
<i>Dreary.</i>	9752	CE-2	1,200 to 2,500	Wood Covered	18 x 8½x 6½	13½	8 80
<i>Dredge.</i>	9753	F-2	2,500 to 3,500	Station Type	14½x 4½x 3½	11½	10 00
<i>Drinker.</i>	9754	F-2	2,500 to 3,500	Wood Covered	20½x 8½x 6½	15½	10 00
<i>Droller.</i>	9755	CE-2	3,500 to 5,000	Station Type	34 x 8 x 6½	26½	22 00
<i>Drouth.</i>	9756	CE-2	3,500 to 5,000	Wood Covered	33 x13 x15½	49	22 00
<i>Drover.</i>	9757	F-2	5,000 to 6,600	Station Type	39½x 8 x17½	41	23 80
<i>Drowsy.</i>	9758	F-2	5,000 to 6,600	Wood Covered	38 x13 x15½	55	23 80
<i>Drudger.</i>	9759	CE-2	6,600 to 7,500	Station Type	48 x 8 x17½	46	36 40
<i>Druggel.</i>	9760	CE-2	6,600 to 7,500	Wood Covered	49 x13 x15½	59	36 40
<i>Drumble.</i>	9761	F-2	7,500 to 8,500	Station Type	56½x 8 x17½	58	39 10
<i>Drummer.</i>	9762	F-2	7,500 to 8,500	Wood Covered	56½x13 x15½	69	39 10
<i>Dualist.</i>	9763	F-2	8,500 to 10,000	Station Type	73 x 8 x18	71	48 60
<i>Dubious.</i>	9764	F-2	8,500 to 10,000	Wood Covered	71 x13 x15½	93	48 60
<i>Ductile.</i>	9765	F-2	10,000 to 12,500	Station Type	89 x 8 x18	89	60 90
<i>Herbel.</i>	10711	F-2	10,000 to 12,500	Wood Covered	87½x13 x15½	116	60 90
<i>Dulcimer.</i>	9766	F-2	12,500 to 15,000	Station Type	106 x 8 x18	106	73 90
<i>Herbid.</i>	10712	F-2	12,500 to 15,000	Wood Covered	104 x13 x15½	139	73 90
<i>Dullness.</i>	9767	F-2	15,000 to 17,500	Station Type	122 x 8 x18	123	89 00
<i>Dumping.</i>	9768	F-2	17,500 to 20,000	Station Type	139 x 8 x18	140	100 00

Above are Manufacturer's List Prices in effect April, 1914.

Westinghouse Lightning Arrester

Type M P



THE Multi-Path Lightning Arrester illustrated above supersedes the old Wurtz type of arrester and is suitable for use as a protection to the line, car equipment or as a station arrester on either alternating or direct current circuits up to 1000 volts. It is single pole and offers a freedom of discharge many times greater than any other type of low voltage arrester. Its name is derived from the fact that the static discharge spreads itself over a carborundum block along a number of minute discharge paths. The voltage across each gap is very small; therefore, the line voltage cannot maintain an arc across them.

Code Word
Duncify.

No.	List Each
9770—Type M P Lightning Arrester.....	\$5 65
Above is Manufacturer's List Price in effect April, 1914.	

Insulating Tapes



THE Buckeye brand of Friction Tape is our own special one, and will fill all requirements where a fair quality of goods at low prices is desired.

Code Word	No.	List per Pound
<i>Dungeon.</i>	1686—Buckeye, Black $\frac{3}{4}$ -inch wide.....	\$0 60
<i>Dutiful.</i>	2849—Manson, “ $\frac{3}{4}$ “ “.....	1 35
<i>Earldom.</i>	7619—P. & B. Weatherproof, $\frac{3}{4}$ -inch wide.....	80

Cook Feeder Wire Sheave



INTENDED to facilitate stringing of heavy feeder wires. It is slipped over the top of an insulator pin, and the feeder wire passed over the pulley. By placing a Sheave on each pole, the wire may be drawn over a number of cross arms at one time with ease, and without injury to the insulation. Will take wires up to $1\frac{5}{8}$ inches diameter.

Code Word	No.	List Each
<i>Embrace.</i>	7623—Feeder Wire Sheave Japped.....	\$1 80

Clinching Block

For Trolley Ears



MADE of cast iron shaped to fit over boss of trolley ear and provide a heavy backing for ear while lips are clinched over wire.
Can be used with any clinch ear for round wire listed in this catalogue.

Code Word	No.	List Each
<i>Labent.</i>	11372—Clinching Block, Japanned.....	\$1 65

Stripping Tool

For Trolley Ears

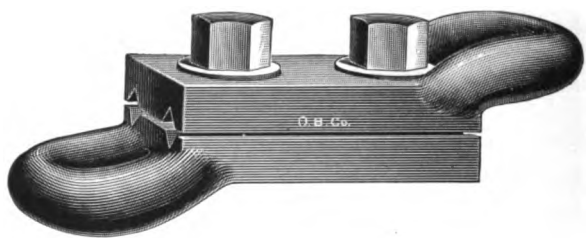


DESIGNED to facilitate removal of ears from trolley wire. When pointed end is placed between wire and lips of ear, a few blows of a hammer will open lips sufficiently to strip ear from wire.
Can be used with any clinch ear listed in this catalogue.

Code Word	No.	List Each
<i>Elective.</i>	8123—Stripping Tool.....	\$3 30

Trolley Wire Screw Clamp

For Round, Figure 8 and Grooved Wires

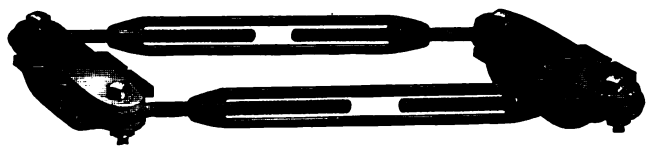


MAY be used either as a permanent or temporary clamp interchangeably with Round, Figure 8 and Grooved Wires, from Nos. 0 to 4-0 B. & S. gauge inclusive.

Code Word	No.	List Each
<i>Elatedly.</i>	5329—Screw Clamp	\$1 20

Trolley Wire Tightener

For Round, Figure 8 and Grooved Wires

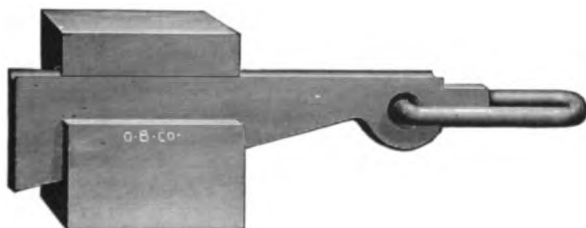


USED in splicing trolley wires and will fit 0 to 4-0 Round, Grooved and Figure 8 wires. Length, center to center of clamps, maximum, 30 $\frac{3}{4}$ inches; minimum, 18 $\frac{3}{4}$ inches. The $\frac{3}{4}$ -inch turnbuckles are sherardized and are set 6 $\frac{1}{2}$ inches apart to provide ample clearance for splicing.

Code Word	No.	List Each
<i>Elderly.</i>	8126—Tightener	\$8 80

Trolley Wire Wedge Clamp

For Round, Figure 8 and Grooved Wires



THIS Clamp secures a very powerful grip on the wire, as the greater the strain, the greater is the gripping effect of the Clamp. The grip of the Clamp on the wire is so positive that it can be released only by striking the small end of the wedge with a hammer.

Code Word	No.	List Each
<i>Embargo.</i>	8125—Wedge Clamp, Japanned.....	\$4 95

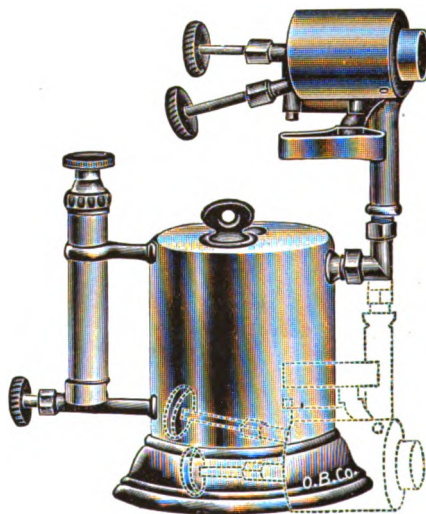
Haven's Wire Eccentric



Code Word	No.	List Each
<i>Emerald.</i>	5328—For No. 8 B. & S. and smaller diameters of Wire.....	\$3 30
<i>Emigrate.</i>	1799— " $\frac{1}{4}$ inch " " " "	5 50

Turner Double Jet Blow Torch

Capacity One Quart



THE Double Jet Torch has a swiveled burner as shown in the illustration and is unequalled for heavy soldering, melting or brazing, and, as the burner is protected by a wind shield, it is particularly suitable for outside work. One of these jets regulates the flow of gas and the other the air mixture, so that a very intense heat can be produced.

The height over-all is $11\frac{1}{4}$ inches, diameter 4 inches, and the net weight $3\frac{1}{2}$ pounds.

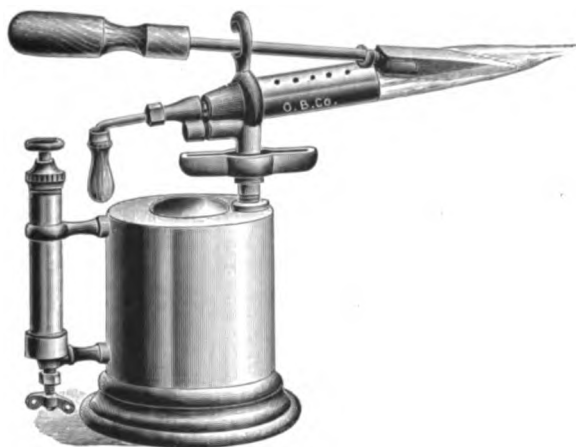
The use of 74 degree gasoline is recommended and the torch consumes approximately $1\frac{1}{4}$ pints per hour.

Code Word
Eminent.

No.	List Each
9781—Double Jet Torch, polished brass.....	\$13 20

Hot Blast Combination Blow Torch

Capacity One Quart



THE Combination Blow Torch illustrated above has a new coil burner which vaporizes all the gasoline above the torch, and the flame passing through this coil generates a strong, steady flame at all times. It has an attachment on the burner for holding a soldering iron.

The tank is made of 18 gauge seamless brass with a concave steel bottom.

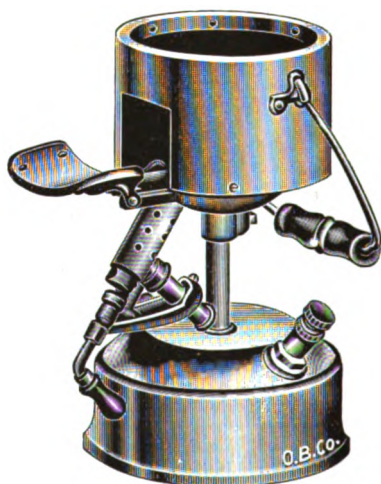
The height over-all is 10 inches, diameter $4\frac{1}{2}$ inches and the net weight 4 pounds.

The use of 74 degree gasoline is recommended with this torch and it consumes approximately $\frac{1}{2}$ pint per hour.

Code Word	No.	List Each
<i>Emissary.</i>	5373—Torch.....	\$9 35

Hot Blast Combination Furnace

Capacity Three Quarts



WILL heat a pair of five pound or smaller soldering coppers and melt a pot of metal at the same time. The burner is simple in construction and can be used either indoors or outdoors in a wind. The tank is made of polished brass and is fitted with an automatic brass pump.

Height, overall, $12\frac{3}{4}$ inches; diameter, $7\frac{1}{4}$ inches; net weight, 9 pounds.

The consumption is approximately 1 pint per hour.

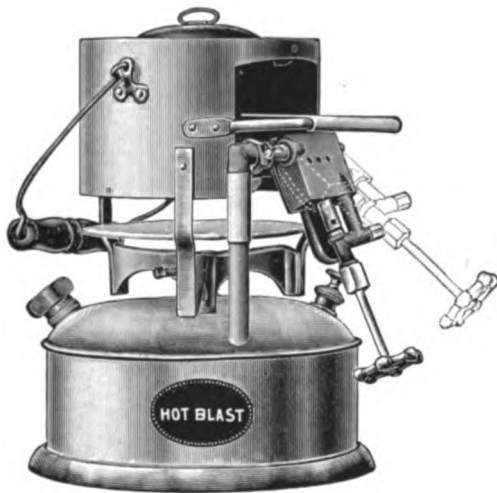
A Solder Pot 5 inches in diameter may be used with this furnace.

Code Word
Lingel.

No.	List Each
11314—Furnace.....	\$9 90

Hot Blast Bonanza Furnace

Capacity Three Quarts



THE Bonanza Furnace has a heavy galvanized iron tank fitted with an automatic brass pump inside the tank. The tank can be used for heating soldering irons as well as melting lead, and the special bronze burner is swiveled so as to change the direction of the flame from the irons to the lead pot, as desired.

The height over-all is 12 inches, diameter $8\frac{1}{2}$ inches and the net weight 9 pounds.

The use of 74 degree gasoline is recommended and it consumes approximately $\frac{1}{4}$ pint per hour.

A Solder Pot 5 inches in diameter may be used with this furnace.

Code Word
Empanel.

No.	List Each
9783—Furnace.....	\$9 90

Solder Pots



Code Word	No.	List Each
<i>Emperil.</i>	9784—Solder Pot, diameter 5 inches.....	\$0 90
<i>Emperor.</i>	9785— " " " 6 "	1 25

Solder Ladles



Code Word	No.	List Each
<i>Emphasis.</i>	2989—Ladle, diameter of Bowl 3 inches.....	\$0 55
<i>Emphatic.</i>	9786— " " " 4 "	80

Pointed Soldering Coppers



Code Word	No.	List per Pair
<i>Empire.</i>	5368—Weight per pair, 2 pounds.....	\$2 00
<i>Empress.</i>	5369— " " 4 "	3 65
<i>Emulate.</i>	5371—Wood Handles.....	15

Grooved Soldering Copper



Grooved on lower face to solder ears on trolley wire.

Code Word	No.	List Each
<i>Enation.</i>	1801—Grooved Copper with Handle.....	\$6 05

Half-and-Half Solder



Code Word	No.	List per Pound
<i>Encamp.</i>	1689—Bar Solder	\$0 65
<i>Enchant.</i>	1691—Wire “ No. 10 B. & S., 68 pounds per spool.....	70

Celerity Soldering Salts

THIS is a very satisfactory, quick-acting, non-corrosive salts, manufactured exclusively for us, and is heartily recommended.

Code Word	No.	List Each
<i>Encore.</i>	9732—Celerity Soldering Salts, 1-pound bottle.....	\$0 55

Highland Soldering Paste

Absolutely free from acid or any ingredient injurious to insulation.

Code Word	No.	List per Box
<i>Endict.</i>	2850—Two-ounce Box.....	\$0 40

O-B Rail Bonds

Patented

ON the following pages are shown the standard types and sizes in which O-B Compressed, Pin Driven and Soldered Terminal Rail Bonds are regularly manufactured.

In addition to these we are prepared to furnish to order, if desired, a variety of special styles and types, as well as special lengths and capacities not included in the regular lists.

In case of any peculiar track conditions to be met, or any information desired, we are always glad to give customers the advantage of our long experience in furnishing bonds to meet all conditions.

Directions for Ordering

In ordering Bonds it is necessary that the following information be given us as fully as possible, viz.: *The type and form of bond desired, the distance from center to center of terminals, the diameter of terminals, the size or capacity required, the section number of rail and splice bar and maker's name, the distance from end of rail to center of first bolt hole, the distance between centers of first and second bolt holes, and the diameter of bolts.* If the bond holes are already drilled, *the distance from the ends of rails to the centers of holes for bond terminals* should be given in addition to the information called for above.

Rail Bond Data

A Rail Bond Booklet, containing valuable engineering data and information on methods of bonding, loss of power, drop in voltage, electrical efficiency, etc., and pertaining generally to the installation and maintenance of track return circuits, under varying conditions, will be mailed on request.

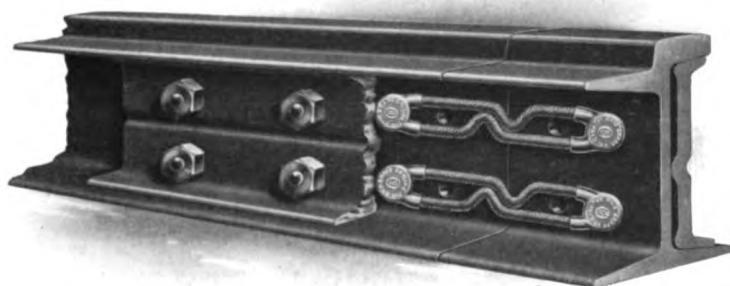
O-B Rail Bonds

Patented

Compressed Terminal



Type F-3 Bond on Web of Tee Rail



Girder Rail double bonded with Type F-3 Bonds



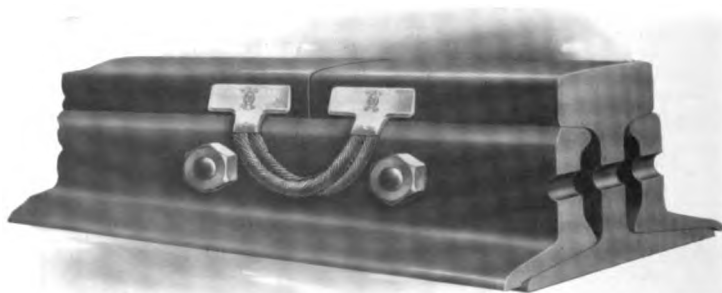
Type E Bond on Web of Tee Rail

O-B Rail Bonds

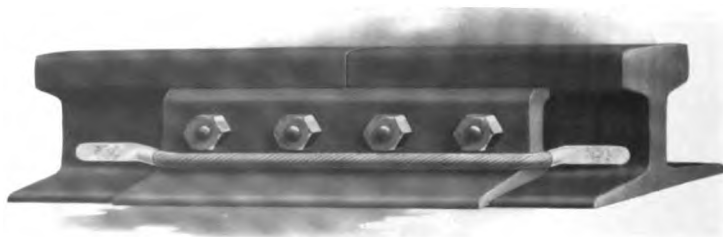
Patented



Type J Bond on Ball of Tee Rail



Type M Soldered Terminal Bond on Ball of Tee Rail



Type HL Soldered Terminal Bond on Web of Tee Rail

Dimensions of Standard Tee Rails

A. S. C. E. Section

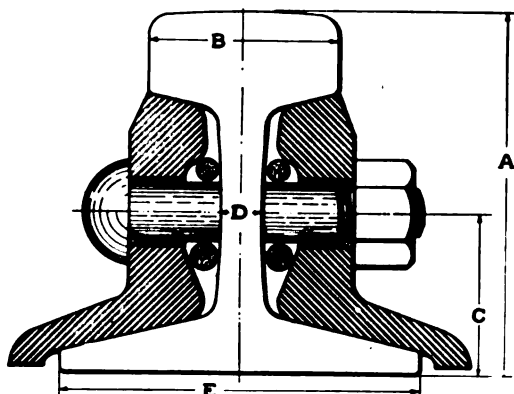


Figure 1

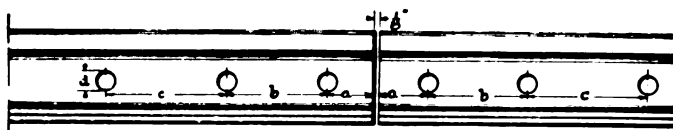
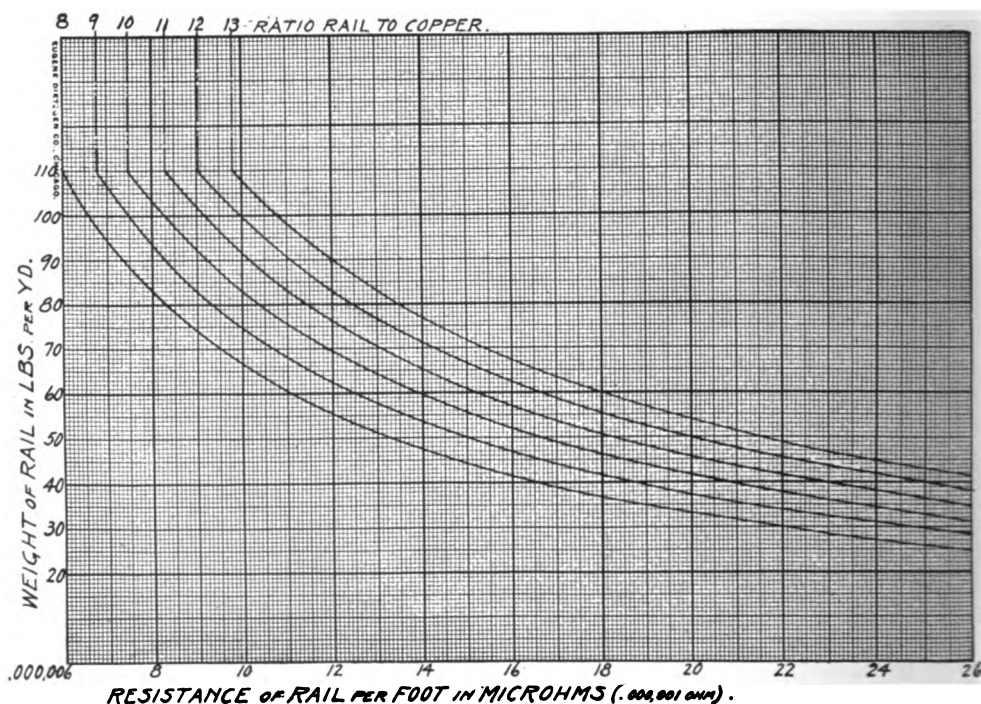


Figure 2

Weight of Rail per yard in Pounds	Dimensions of Rail Sections in Inches See Figure 1					Drilling of Rail in Inches See Figure 2				Section of Rail in Square Inches
	A	B	C	D	E	a	b	c	d	
16	2 $\frac{3}{8}$	1 $\frac{11}{16}$	1 $\frac{7}{16}$	$\frac{7}{16}$	2 $\frac{3}{8}$	2	4	..	$\frac{5}{16}$	1.57
20	2 $\frac{3}{8}$	1 $\frac{11}{16}$	1 $\frac{7}{16}$	$\frac{7}{16}$	2 $\frac{3}{8}$	2	4	..	$\frac{5}{16}$	1.96
30	3 $\frac{1}{8}$	1 $\frac{11}{16}$	1 $\frac{7}{16}$	$\frac{7}{16}$	3 $\frac{1}{8}$	2	4	..	$\frac{5}{16}$	2.94
40	3 $\frac{1}{8}$	1 $\frac{7}{8}$	1 $\frac{7}{8}$	$\frac{7}{8}$	3 $\frac{1}{8}$	2 $\frac{1}{2}$	5	..	$\frac{5}{16}$	3.92
45	3 $\frac{1}{8}$	2	1 $\frac{7}{8}$	$\frac{7}{8}$	3 $\frac{1}{8}$	2 $\frac{1}{2}$	5	..	$\frac{7}{16}$	4.42
50	3 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{7}{8}$	$\frac{7}{8}$	3 $\frac{1}{8}$	2 $\frac{1}{2}$	5	..	1	4.90
55	4 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{10}{16}$	$\frac{9}{16}$	4 $\frac{1}{8}$	2 $\frac{1}{2}$	5	..	1	5.39
60	4 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{11}{16}$	$\frac{9}{16}$	4 $\frac{1}{8}$	2 $\frac{1}{2}$	5	..	1	5.88
65	4 $\frac{1}{8}$	2 $\frac{3}{8}$	1 $\frac{11}{16}$	$\frac{9}{16}$	4 $\frac{1}{8}$	2 $\frac{1}{2}$	5	..	1	6.37
70	4 $\frac{1}{8}$	2 $\frac{7}{8}$	2 $\frac{7}{8}$	$\frac{9}{8}$	4 $\frac{1}{8}$	2 $\frac{1}{2}$	5	6	1	6.86
75	4 $\frac{1}{8}$	2 $\frac{7}{8}$	2 $\frac{7}{8}$	$\frac{9}{8}$	4 $\frac{1}{8}$	2 $\frac{1}{2}$	5	6	1	7.35
80	5	2 $\frac{7}{8}$	2 $\frac{7}{8}$	$\frac{9}{8}$	5	2 $\frac{1}{2}$	5	6	1	7.84
85	5 $\frac{3}{16}$	2 $\frac{9}{16}$	2 $\frac{7}{8}$	$\frac{9}{8}$	5 $\frac{3}{16}$	2 $\frac{1}{2}$	5	6	1	8.33
90	5 $\frac{3}{16}$	2 $\frac{9}{16}$	2 $\frac{7}{8}$	$\frac{9}{8}$	5 $\frac{3}{16}$	2 $\frac{1}{2}$	5	6	1	8.82
95	5 $\frac{9}{16}$	2 $\frac{11}{16}$	2 $\frac{7}{8}$	$\frac{9}{8}$	5 $\frac{9}{16}$	2 $\frac{1}{2}$	5	6	1	9.31
100	5 $\frac{3}{4}$	2 $\frac{3}{4}$	2 $\frac{7}{8}$	$\frac{9}{8}$	5 $\frac{3}{4}$	2 $\frac{1}{2}$	5	6	1	9.80
110	6 $\frac{1}{8}$	2 $\frac{7}{8}$	2 $\frac{7}{8}$	$\frac{9}{8}$	6 $\frac{1}{8}$	2 $\frac{1}{2}$	5	6	1	10.80

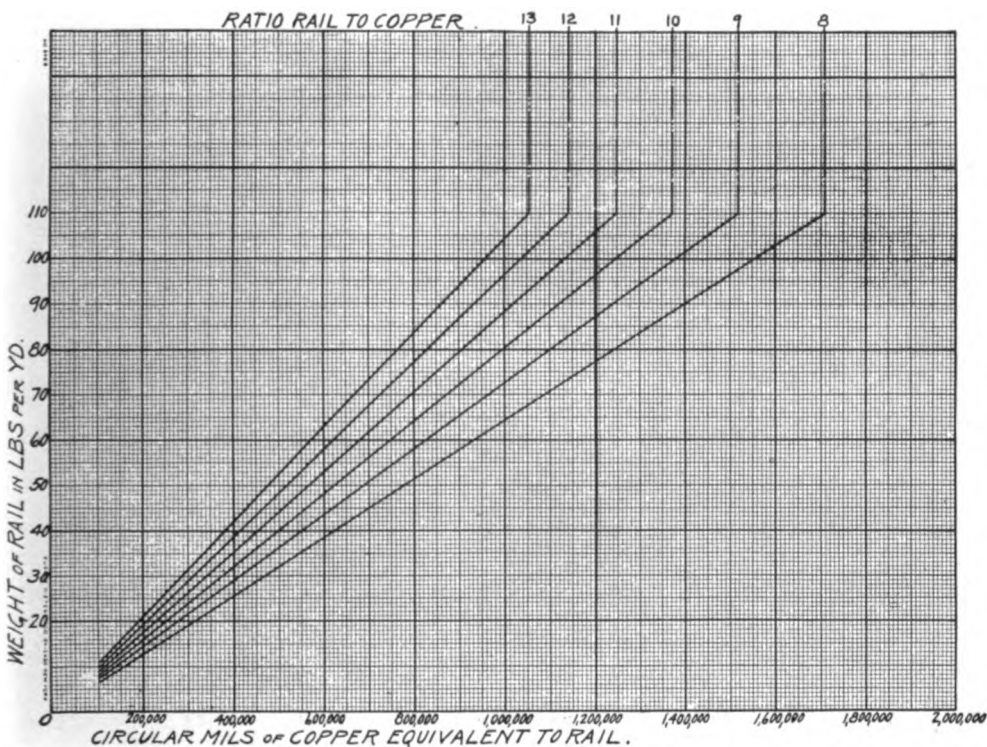
Resistance of Steel Rails



THIS chart shows the resistance of 1 foot length of rail in microhms (.000,001 ohm) for different weights of rail and ratios of rail to copper.

EXAMPLE: What is the resistance per foot of a 70-pound per yard rail for a ratio of 11 to 1? Follow the horizontal line through 70, at the left, to the right until it intersects the curve marked 11, then follow the vertical line through the intersection downward and read .000,013 ohm per foot.

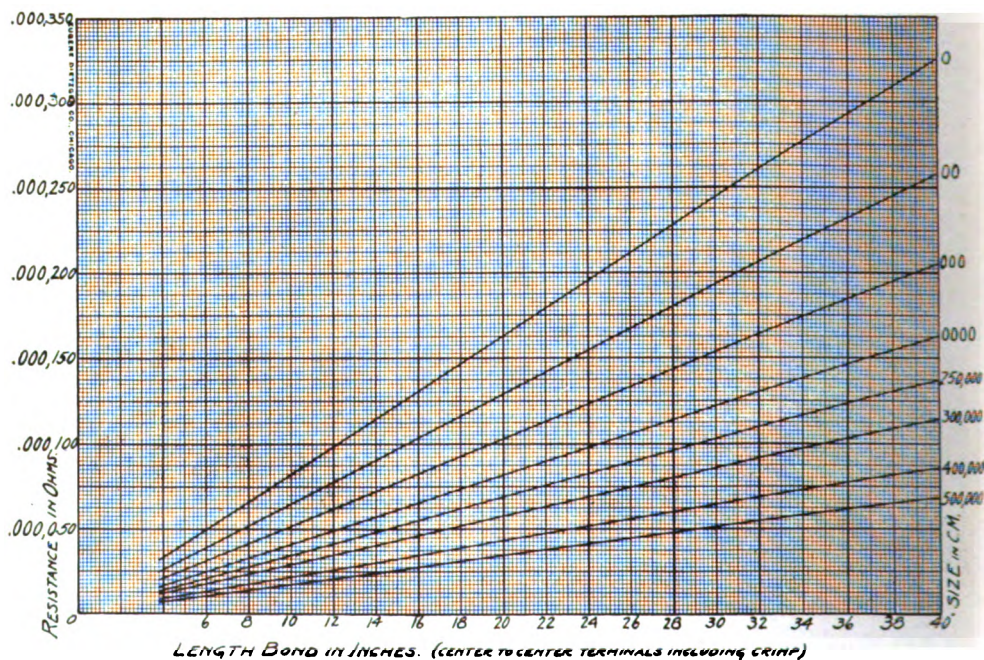
Copper Equivalent of Steel Rails



THIS chart shows the equivalent section in copper of different weights of rail for various ratios of the resistance of the rail to that of copper.

EXAMPLE: What is the equivalent cross section of copper for a 60 pound per yard rail having a ratio of 11 to 1? Follow the horizontal line through 60, at the left, to the right until it intersects the curve marked 11, at the top, and follow down on the vertical line through this intersection and read 680,000 circular mils, the equivalent of the rail in copper.

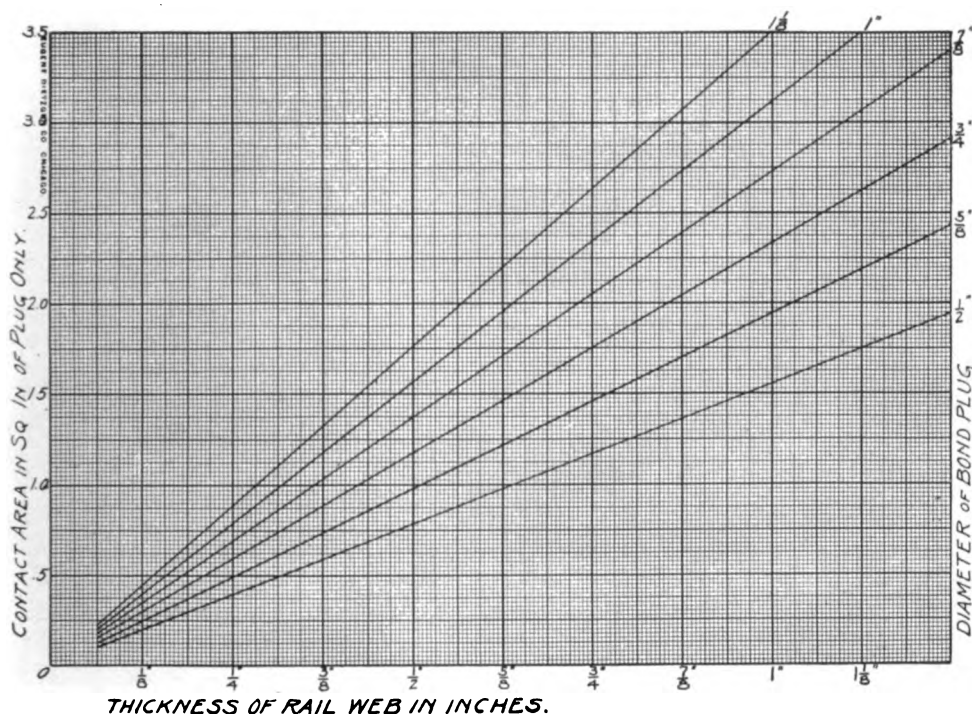
Resistance of Rail Bonds



THIS chart shows the resistance of different capacities and lengths of rail bonds. The length is the unformed length between centers of terminals.

EXAMPLE: What capacity of bond 24 inches long will have a resistance of .0001 ohm? Follow horizontal line through .000,100, at left, to the right until it intersects the vertical line through 24 inches—and the nearest curve is that marked 0000, the capacity of the required bond.

Contact Area of Compressed Terminals



THIS chart shows the contact area of a compressed terminal for different diameters of terminal plug and thicknesses of rail web.

EXAMPLE: What is the contact area of a compressed terminal 1 inch in diameter compressed into a rail having a web $\frac{3}{4}$ -inch thick? Follow the vertical line through $\frac{3}{4}$ -inch, at the bottom, upward until it intersects the curve of 1-inch diameter plug, then follow the horizontal line through this intersection to the left and read 1.95 square inches contact area between the compressed plug and the rail web.

O-B Rail Bonds

Patented

Compressed or Pin Driven Terminal

Types A and AP



Type A—Compressed Terminal



Type AP—Pin Driven Terminal

INTENDED for use on web of rail under splice bar, where available clearance does not permit use of a double stranded bond or where conditions require a single strand bond looping not more than one bolt.

In ordering it is necessary to specify distance between terminals when bond is formed ready for use, thickness to which strands are to be flattened to fit available clearance and radius of curvature of bond or distance from middle of line through terminal centers to bottom of strand.

Regularly furnished with either Compressed or Pin Driven terminals in following sizes: 0 capacity, $\frac{1}{4}$ -inch and $\frac{5}{8}$ -inch terminals; 2-0 capacity, $\frac{1}{4}$ -inch, $\frac{5}{8}$ -inch and $\frac{3}{4}$ -inch terminals; 3-0 and 4-0 capacity, $\frac{3}{4}$ -inch and $\frac{7}{8}$ -inch terminals, and in lengths not less than 4 inches.

Can be furnished in any desired length, capacity and size of terminal.

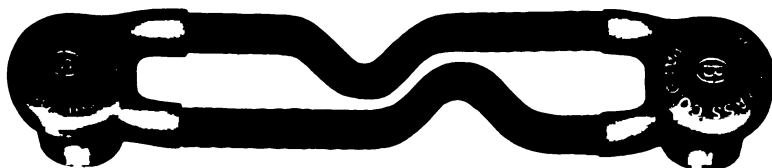
In ordering Bonds give full information as called for on page 434.

O-B Rail Bonds

Patented

Compressed Terminal

Type F-3



INTEENDED for installing on web of rail under splice bar and can be used singly to span one or more bolts or can be combined for double or quadruple bonding.

Flexible body portions are made from same size of copper cable.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal, in Inches	Length of Terminal under head, Inches	List per 100
<i>Mucigen.</i>	11974	8	0	1-2	5-8	\$46 00
<i>Mucilage.</i>	11975	8	0	5-8	5-8	48 50
<i>Mucksy.</i>	11976	8	2-0	1-2	5-8	51 40
<i>Mucocele.</i>	11977	8	2-0	5-8	5-8	51 40
<i>Muconate.</i>	11978	8	2-0	3-4	3-4	56 90
<i>Mucosity.</i>	11979	8	3-0	3-4	3-4	63 80
<i>Muculent.</i>	11980	8	3-0	7-8	3-4	65 80
<i>Mudarin.</i>	11981	8	4-0	3-4	3-4	66 50
<i>Muddle.</i>	11982	8	4-0	7-8	3-4	69 00

A variation of $\frac{1}{4}$ inch in length of terminal under head is allowed.

Above bonds can be furnished in any desired length, capacity and size of terminal.
In ordering give full information as called for on page 434.

O-B Rail Bonds

Patented

Compressed Terminal

Type F-3—Continued

Code Word	No.	Length Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal in Inches	Length of Terminal under head in Inches	List per 100
<i>Mudfish.</i>	11983	9	0	1-2	5-8	\$47 50
<i>Mudsill.</i>	11984	9	0	5-8	5-8	50 00
<i>Mudwort.</i>	11985	9	2-0	1-2	5-8	53 00
<i>Muezzin.</i>	11986	9	2-0	5-8	5-8	53 00
<i>Muffetee.</i>	11987	9	2-0	3-4	3-4	58 50
<i>Muffle.</i>	11988	9	3-0	3-4	3-4	66 20
<i>Muffler.</i>	11989	9	3-0	7-8	3-4	68 20
<i>Muggard.</i>	11990	9	4-0	3-4	3-4	69 50
<i>Mugiloid.</i>	11991	9	4-0	7-8	3-4	72 00
<i>Mugwump.</i>	11992	10	0	1-2	5-8	49 00
<i>Mulberry.</i>	11993	10	0	5-8	5-8	51 50
<i>Muleteer.</i>	11994	10	2-0	1-2	5-8	54 60
<i>Mullein.</i>	11995	10	2-0	5-8	5-8	54 60
<i>Muller.</i>	11996	10	2-0	3-4	3-4	60 10
<i>Mullock.</i>	11997	10	3-0	3-4	3-4	68 60
<i>Multeity.</i>	11998	10	3-0	7-8	3-4	70 60
<i>Multifid.</i>	11999	10	4-0	3-4	3-4	72 50
<i>Mumble.</i>	12000	10	4-0	7-8	3-4	75 00
<i>Mummify.</i>	12001	11	0	1-2	5-8	50 60
<i>Mumpish.</i>	12002	11	0	5-8	5-8	53 10
<i>Muncher.</i>	12003	11	2-0	1-2	5-8	56 30
<i>Mundify.</i>	12004	11	2-0	5-8	5-8	56 30
<i>Munerate.</i>	12005	11	2-0	3-4	3-4	61 80
<i>Munition.</i>	12006	11	3-0	3-4	3-4	71 10
<i>Munjeet.</i>	12007	11	3-0	7-8	3-4	73 10
<i>Muntjac.</i>	12008	11	4-0	3-4	3-4	75 60
<i>Murezan.</i>	12009	11	4-0	7-8	3-4	78 10
<i>Muriate.</i>	12010	12	4-0	7-8	3-4	81 20
<i>Muriform.</i>	12011	13	4-0	7-8	3-4	84 30

A variation of $\frac{1}{4}$ inch in length of terminal under head is allowed.

Above bonds can be furnished in any desired length, capacity and size of terminal.

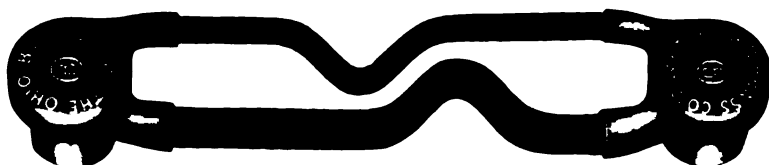
In ordering give full information as called for on page 434.

O-B Rail Bonds

Patented

Compressed Terminal

Type F-4



IN TENDED for installing on web of rail under splice bar and can be used singly to span one or more bolts or can be combined for double or quadruple bonding.

Flexible body portions are made from unequal sizes of copper cable.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal In Inches	Length of Terminal under head Inches	List per 100
<i>Murkily.</i>	12012	8	4-0	7-8	3-4	\$69 00
<i>Murrain.</i>	12013	9	4-0	7-8	3-4	72 00
<i>Murrelet.</i>	12014	10	4-0	7-8	3-4	75 00
<i>Musard.</i>	12015	11	4-0	7-8	3-4	78 10
<i>Muscadel.</i>	12016	12	4-0	7-8	3-4	81 20
<i>Muscarin.</i>	12017	13	4-0	7-8	3-4	84 30

A variation of $\frac{1}{16}$ inch in length of terminal under head is allowed.

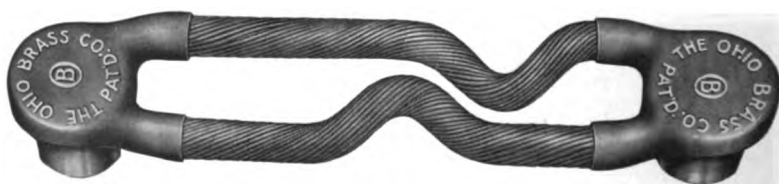
Above bonds can be furnished in any desired length, capacity and size of terminal.
In ordering give full information as called for on page 434.

O-B Rail Bonds

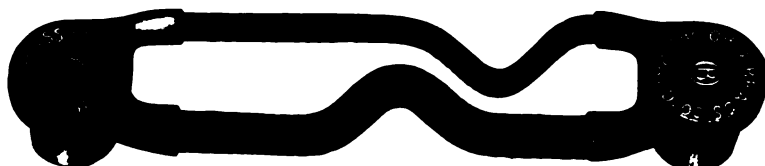
Patented

Compressed Terminal

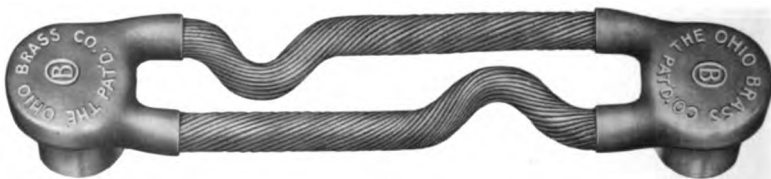
Types F-5—F-8



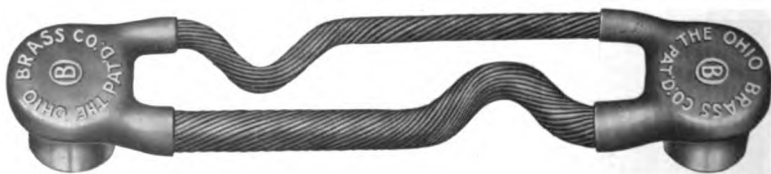
F-5



F-6



F-7



F-8

Types F-5 and F-7 Bonds can be furnished in same sizes and capacities as the F-3 Bond listed on pages 443 and 444.

Types F-6 and F-8 Bonds can be furnished in same sizes and capacities as the F-4 Bond listed on page 445.

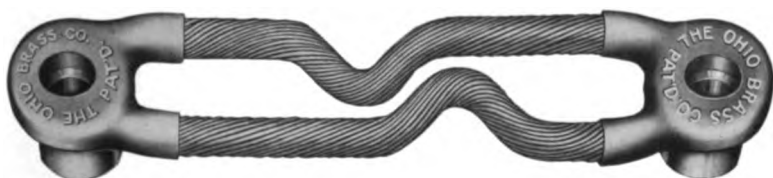
Above Bonds can also be furnished with pin driven terminals.

O-B Rail Bonds

Patented

Pin Driven Terminal

Type FP-3



INTENDED for installing on web of rail under splice bar and can be used singly to span one or more bolts or can be combined for double or quadruple bonding.

Flexible body portions are made from same size of copper cable.

Bonds are furnished complete with Steel Expansion Pins.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal In Inches	Length of Terminal under head Inches	List per 100
<i>Nephew.</i>	12121	8	0	1-2	5-8	\$46 00
<i>Nepotic.</i>	12122	8	0	5-8	5-8	48 50
<i>Neptune.</i>	12123	8	2-0	1-2	5-8	51 40
<i>Nereid.</i>	12124	8	2-0	5-8	5-8	51 40
<i>Neroli.</i>	12125	8	2-0	3-4	3-4	56 90
<i>Nerved.</i>	12126	8	3-0	3-4	3-4	63 80
<i>Nervine.</i>	12127	8	3-0	7-8	3-4	65 80
<i>Nervous.</i>	12128	8	4-0	3-4	3-4	66 50
<i>Nestful.</i>	12129	8	4-0	7-8	3-4	69 00

A variation of $\frac{1}{4}$ inch in length of terminal under head is allowed.

Above bonds can be furnished in any desired length, capacity and size of terminal.

In ordering give full information as called for on page 434.

For listing of Steel Expansion Pins, see page 458.

O-B Rail Bonds

Patented

Pin Driven Terminal

Type FP-3—Continued

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal, in Inches	Length of Terminal under head, Inches	List per 100
<i>Nestling.</i>	12130	9	0	1-2	5-8	\$47 50
<i>Netfish.</i>	12131	9	0	5-8	5-8	50 00
<i>Netling.</i>	12132	9	2-0	1-2	5-8	53 00
<i>Nettles.</i>	12133	9	2-0	5-8	5-8	53 00
<i>Network.</i>	12134	9	2-0	3-4	3-4	58 50
<i>Neural.</i>	12135	9	3-0	3-4	3-4	66 20
<i>Neurism.</i>	12136	9	3-0	7-8	3-4	68 20
<i>Neurotic.</i>	12137	9	4-0	3-4	3-4	69 50
<i>Neuter.</i>	12138	9	4-0	7-8	3-4	72 00
<i>Nevadite.</i>	12139	10	0	1-2	5-8	49 00
<i>Newcomer.</i>	12140	10	0	5-8	5-8	51 50
<i>Newness.</i>	12141	10	2-0	1-2	5-8	54 60
<i>Newsboy.</i>	12142	10	2-0	5-8	5-8	54 60
<i>Newsroom.</i>	12143	10	2-0	3-4	3-4	60 10
<i>Nexible.</i>	12144	10	3-0	3-4	3-4	68 60
<i>Nibble.</i>	12145	10	3-0	7-8	3-4	70 60
<i>Niblick.</i>	12146	10	4-0	3-4	3-4	72 50
<i>Nicene.</i>	12147	10	4-0	7-8	3-4	75 00
<i>Nicely.</i>	12148	11	0	1-2	5-8	50 60
<i>Nicker.</i>	12149	11	0	5-8	5-8	53 10
<i>Nickname.</i>	12150	11	2-0	1-2	5-8	56 30
<i>Nicotic.</i>	12151	11	2-0	5-8	5-8	56 30
<i>Nidget.</i>	12152	11	2-0	3-4	3-4	61 80
<i>Nidulant.</i>	12153	11	3-0	3-4	3-4	71 10
<i>Niellist.</i>	12154	11	3-0	7-8	3-4	73 10
<i>Niggard.</i>	12155	11	4-0	3-4	3-4	75 60
<i>Nightly.</i>	12156	11	4-0	7-8	3-4	78 10
<i>Nightcap.</i>	12157	12	4-0	7-8	3-4	81 20
<i>Nightled.</i>	12158	13	4-0	7-8	3-4	84 30

A variation of $\frac{1}{16}$ inch in length of terminal under head is allowed.

Above bonds can be furnished in any desired length, capacity and size of terminal.

In ordering give full information as called for on page 434.

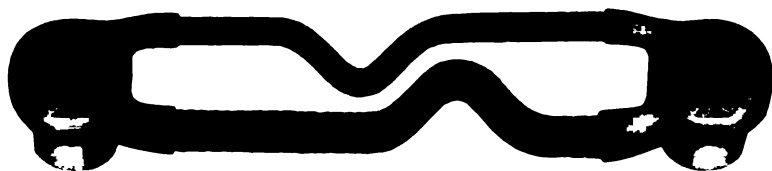
For listing of Steel Expansion Pins, see page 458.

O-B Rail Bonds

Patented

Pin Driven Terminal

Type FP-4



INTENDED for installing on web of rail under splice bar and can be used singly to span one or more bolts or can be combined for double or quadruple bonding.

Flexible body portions are made from unequal sizes of copper cable.

Bonds are furnished complete with Steel Expansion Pins.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal in Inches	Length of Terminal under head in Inches	List per 100
<i>Nightly.</i>	12159	8	4-0	7-8	3-4	\$69 00
<i>Nightman.</i>	12160	9	4-0	7-8	3-4	72 00
<i>Nihilism.</i>	12161	10	4-0	7-8	3-4	75 00
<i>Nilotic.</i>	12162	11	4-0	7-8	3-4	78 10
<i>Nimble.</i>	12163	12	4-0	7-8	3-4	81 20
<i>Nimbose.</i>	12164	13	4-0	7-8	3-4	84 30

A variation of $\frac{1}{4}$ inch in length of terminal under head is allowed.

Above Bonds can be furnished in any desired length, capacity and size of terminal.

In ordering give full information as called for on page 434.

For listing of Steel Expansion Pins, see page 458.

O-B Rail Bonds

Patented

Compressed Terminal

Type E



USED either for cross bonding or bonding around fish plate, where there is not sufficient clearance to permit using the proper capacity of bond under the fish plate.

Also well adapted for bonding old track, as it is not necessary to remove fish plates.

Bonds should be 6 inches longer than fish plates; distance, center to center of holes should be 4 inches greater than length of fish plates.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal, in Inches	Length of Terminal under head, Inches	List per 100
<i>Muscatel.</i>	12018	22	0	1-2	5-8	\$ 68 10
<i>Muscid.</i>	12019	22	0	5-8	5-8	70 60
<i>Muscle.</i>	12020	22	2-0	1-2	5-8	75 70
<i>Muscular.</i>	12021	22	2-0	5-8	5-8	75 70
<i>Museful.</i>	12022	22	2-0	3-4	3-4	81 20
<i>Musette.</i>	12023	22	3-0	3-4	3-4	98 10
<i>Mushroom.</i>	12024	22	3-0	7-8	3-4	100 10
<i>Musical.</i>	12025	22	4-0	3-4	3-4	109 30
<i>Musket.</i>	12026	22	4-0	7-8	3-4	111 80
<i>Musketry.</i>	12027	24	0	1-2	5-8	71 10
<i>Muskral.</i>	12028	24	0	5-8	5-8	73 60
<i>Muskwood.</i>	12029	24	2-0	1-2	5-8	79 30
<i>Musquito.</i>	12030	24	2-0	5-8	5-8	79 30
<i>Mussel.</i>	12031	24	2-0	3-4	3-4	84 80
<i>Mussite.</i>	12032	24	3-0	3-4	3-4	102 70
<i>Mustache.</i>	12033	24	3-0	7-8	3-4	104 70
<i>Mustard.</i>	12034	24	4-0	3-4	3-4	114 70
<i>Mustily.</i>	12035	24	4-0	7-8	3-4	117 20
<i>Mutable.</i>	12036	26	0	1-2	5-8	74 10
<i>Mutage.</i>	12037	26	0	5-8	5-8	76 60
<i>Mutandum.</i>	12038	26	2-0	1-2	5-8	82 90
<i>Mutation.</i>	12039	26	2-0	5-8	5-8	82 90
<i>Mutilate.</i>	12040	26	2-0	3-4	3-4	88 40
<i>Mutiny.</i>	12041	26	3-0	3-4	3-4	107 30
<i>Mutuary.</i>	12042	26	3-0	7-8	3-4	109 30
<i>Muzarab.</i>	12043	26	4-0	3-4	3-4	120 10
<i>Muzzle.</i>	12044	26	4-0	7-8	3-4	122 60

A variation of $\frac{1}{4}$ inch in length of terminal under head is allowed.

Above bonds can be furnished in any desired length, capacity and size of terminal.

In ordering give full information as called for on page 434.

O-B Rail Bonds

Patented

Compressed Terminal

Type E—Continued

Code Word	No.	Length, Center to Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal in Inches	Length of Terminal under head in Inches	List per 100
<i>Mycology.</i>	12045	28	0	1-2	5-8	\$ 77 10
<i>Mycose.</i>	12046	28	0	5-8	5-8	79 60
<i>Myloodon.</i>	12047	28	2-0	1-2	5-8	86 50
<i>Myinchery.</i>	12048	28	2-0	5-8	5-8	86 50
<i>Myogalid.</i>	12049	28	2-0	3-4	3-4	92 00
<i>Myolin.</i>	12050	28	3-0	3-4	3-4	111 90
<i>Myosis.</i>	12051	28	3-0	7-8	3-4	113 90
<i>Myolome.</i>	12052	28	4-0	3-4	3-4	125 50
<i>Myriad.</i>	12053	28	4-0	7-8	3-4	128 00
<i>Myricin.</i>	12054	30	0	1-2	5-8	80 10
<i>Myronic.</i>	12055	30	0	5-8	5-8	82 60
<i>Myrtle.</i>	12056	30	2-0	1-2	5-8	90 10
<i>Mystery.</i>	12057	30	2-0	5-8	5-8	90 10
<i>Mystical.</i>	12058	30	2-0	3-4	3-4	95 60
<i>Mystify.</i>	12059	30	3-0	3-4	3 4	116 50
<i>Mythical.</i>	12060	30	3-0	7-8	3-4	118 50
<i>Nacarai.</i>	12061	30	4-0	3-4	3-4	130 90
<i>Nacreous.</i>	12062	30	4-0	7-8	3-4	133 40
<i>Nagging.</i>	12063	32	0	1-2	5-8	83 10
<i>Nainsook.</i>	12064	32	0	5-8	5-8	85 60
<i>Namation.</i>	12065	32	2-0	1-2	5-8	93 70
<i>Nameless.</i>	12066	32	2-0	5-8	5-8	93 70
<i>Namesake.</i>	12067	32	2-0	3-4	3-4	99 20
<i>Napery.</i>	12068	32	3-0	3-4	3-4	121 10
<i>Napiform.</i>	12069	32	3-0	7-8	3-4	123 10
<i>Napoleon.</i>	12070	32	4-0	3-4	3-4	136 30
<i>Narcotic.</i>	12071	32	4-0	7-8	3-4	138 80
<i>Narrable.</i>	12072	36	0	1-2	5-8	89 10
<i>Narrowly.</i>	12073	36	0	5-8	5-8	91 60
<i>Narwhal.</i>	12074	36	2-0	1-2	5-8	100 90
<i>Nasalize.</i>	12075	36	2-0	5-8	5-8	100 90
<i>Nascent.</i>	12076	36	2-0	3-4	3-4	106 40
<i>Nasiform.</i>	12077	36	3-0	3-4	3-4	130 30
<i>Nataloin.</i>	12078	36	3-0	7-8	3-4	132 30
<i>Natant.</i>	12079	36	4-0	3-4	3-4	147 10
<i>Natanly.</i>	12080	36	4-0	7-8	3-4	149 60
<i>Nathmore.</i>	12081	38	4-0	7-8	3-4	155 00
<i>Natica.</i>	12082	40	4-0	7-8	3-4	160 40
<i>Nativism.</i>	12083	42	4-0	7-8	3-4	165 80
<i>Nativity.</i>	12084	48	2-0	5-8	5-8	122 50
<i>Natrium.</i>	12085	60	4-0	7-8	3-4	214 40
<i>Naturist.</i>	12086	66	4-0	7-8	3-4	230 60
<i>Nauscopy.</i>	12087	70	4-0	7-8	3-4	241 40
<i>Nauseate.</i>	12088	72	4-0	7-8	3-4	246 80

A variation of $\frac{1}{16}$ inch in length of terminal under head is allowed.
 Above bonds can be furnished in any desired length, capacity and size of terminal.
 In ordering give full information as called for on page 434.

O-B Rail Bonds

Patented

Pin Driven Terminal

Type EP



USED either for cross bonding or bonding around fish plate where there is not sufficient clearance to permit using the proper capacity of bond under the fish plate.

Also well adapted for bonding old track, as it is not necessary to remove fish plates to install.

Bonds should be 6 inches longer than fish plates; distance, center to center of holes should be 4 inches greater than length of fish plates.

Bonds are furnished complete with Steel Expansion Pins.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal In Inches	Length of Terminal under head Inches	List per 100
<i>Ninefold.</i>	12165	22	0	1-2	5-8	\$ 68 10
<i>Ninepins.</i>	12166	22	0	5-8	5-8	70 60
<i>Nipper.</i>	12167	22	2-0	1-2	5-8	75 70
<i>Nipping.</i>	12168	22	2-0	5-8	5-8	75 70
<i>Nilency.</i>	12169	22	2-0	3-4	3-4	81 20
<i>Nitrate.</i>	12170	22	3-0	3-4	3-4	98 10
<i>Nitrify.</i>	12171	22	3-0	7-8	3-4	100 10
<i>Nitrosyl.</i>	12172	22	4-0	3-4	3-4	109 30
<i>Niveous.</i>	12173	22	4-0	7-8	3-4	111 80
<i>Noachian.</i>	12174	24	0	1-2	5-8	71 10
<i>Nobilify.</i>	12175	24	0	5-8	5-8	73 60
<i>Nobleman.</i>	12176	24	2-0	1-2	5-8	79 30
<i>Noctuary.</i>	12177	24	2-0	5-8	5-8	79 30
<i>Noctuid.</i>	12178	24	2-0	3-4	3-4	84 80
<i>Nocturn.</i>	12179	24	3-0	3-4	3-4	102 70
<i>Nocuous.</i>	12180	24	3-0	7-8	3-4	104 70
<i>Nodated.</i>	12181	24	4-0	3-4	3-4	114 70
<i>Nodding.</i>	12182	24	4-0	7-8	3-4	117 20
<i>Nodical.</i>	12183	26	0	1-2	5-8	74 10
<i>Nodose.</i>	12184	26	0	5-8	5-8	76 60
<i>Noduled.</i>	12185	26	2-0	1-2	5-8	82 90
<i>Noemics.</i>	12186	26	2-0	5-8	5-8	82 90
<i>Noggen.</i>	12187	26	2-0	3-4	3-4	88 40
<i>Noiseful.</i>	12188	26	3-0	3-4	3-4	107 30
<i>Noisily.</i>	12189	26	3-0	7-8	3-4	109 30
<i>Nolleity.</i>	12190	26	4-0	3-4	3-4	120 10
<i>Nomadic.</i>	12191	26	4-0	7-8	3-4	122 60

A variation of $\frac{1}{4}$ inch in length of terminal under head is allowed.

Above Bonds can be furnished in any desired length, capacity and size of terminal.

In ordering give full information as called for on page 434.

For listing of Steel Expansion Pins, see page 458.

O-B Rail Bonds

Patented

Pin Driven Terminal

Type EP—Continued

Code Word	No.	Length, Center to Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal, in Inches	Length of Terminal under head, Inches	List per 100
<i>Nomadism.</i>	12192	28	0	1-2	5-8	\$ 77 10
<i>Nomancy.</i>	12193	28	0	5-8	5-8	79 60
<i>Nombril.</i>	12194	28	2-0	1-2	5-8	86 50
<i>Nominate.</i>	12195	28	2-0	5-8	5-8	86 50
<i>Nominee.</i>	12196	28	2-0	3-4	3-4	92 00
<i>Nomology.</i>	12197	28	3-0	3-4	3-4	111 90
<i>Nonacid.</i>	12198	28	3-0	7-8	3-4	113 90
<i>Nonagon.</i>	12199	28	4-0	3-4	3-4	125 50
<i>Nonelect.</i>	12200	28	4-0	7-8	3-4	128 00
<i>Nonius.</i>	12201	30	0	1-2	5-8	80 10
<i>Nonjuror.</i>	12202	30	0	5-8	5-8	82 60
<i>Nonplane.</i>	12203	30	2-0	1-2	5-8	90 10
<i>Nonplus.</i>	12204	30	2-0	5-8	5-8	90 10
<i>Nonsame.</i>	12205	30	2-0	3-4	3-4	95 60
<i>Nonsense.</i>	12206	30	3-0	3-4	3-4	116 50
<i>Nonuser.</i>	12207	30	3-0	7-8	3-4	118 50
<i>Noonday.</i>	12208	30	4-0	3-4	3-4	130 90
<i>Norian.</i>	12209	30	4-0	7-8	3-4	133 40
<i>Normalcy.</i>	12210	32	0	1-2	5-8	83 10
<i>Norman.</i>	12211	32	0	5-8	5-8	85 60
<i>Norroy.</i>	12212	32	2-0	1-2	5-8	93 70
<i>Nortelry.</i>	12213	32	2-0	5-8	5-8	93 70
<i>Norther.</i>	12214	32	2-0	3-4	3-4	99 20
<i>Northing.</i>	12215	32	3-0	3-4	3-4	121 10
<i>Nosebag.</i>	12216	32	3-0	7-8	3-4	123 10
<i>Nosegay.</i>	12217	32	4-0	3-4	3-4	136 30
<i>Nosing.</i>	12218	32	4-0	7-8	3-4	138 80
<i>Nostoc.</i>	12219	36	0	1-2	5-8	89 10
<i>Notable.</i>	12220	36	0	5-8	5-8	91 60
<i>Nostril.</i>	12221	36	2-0	1-2	5-8	100 90
<i>Notching.</i>	12222	36	2-0	5-8	5-8	100 90
<i>Noteless.</i>	12223	36	2-0	3-4	3-4	106 40
<i>Notional.</i>	12224	36	3-0	3-4	3-4	130 30
<i>Notornis.</i>	12225	36	3-0	7-8	3-4	132 30
<i>Notwheat.</i>	12226	36	4-0	3-4	3-4	147 10
<i>Noumenal.</i>	12227	36	4-0	7-8	3-4	149 60
<i>Nounize.</i>	12228	38	4-0	7-8	3-4	155 00
<i>Nourish.</i>	12229	40	4-0	7-8	3-4	160 40
<i>Novator.</i>	12230	42	4-0	7-8	3-4	165 80
<i>Novelist.</i>	12231	48	2-0	5-8	5-8	122 50
<i>Novene.</i>	12232	60	4-0	7-8	3-4	214 40
<i>Novercal.</i>	12233	66	4-0	7-8	3-4	230 60
<i>Novice.</i>	12234	70	4-0	7-8	3-4	241 40
<i>Novity.</i>	12235	72	4-0	7-8	3-4	246 80

A variation of $\frac{1}{8}$ inch in length of terminal under head is allowed.

Above Bonds can be furnished in any desired length, capacity and size of terminal.

In ordering give full information as called for on page 434.

For listing of Steel Expansion Pins, see page 458.

O-B Solid Wire Rail Bonds

Compressed Terminal

Type S



THERE are a number of instances where the Solid Bond will be found of advantage, as in the case of cross-bonding, bonding around joints in mines, or places where it is not possible to place the bond underneath the splice bar. For exposed places, the solid bond is less liable to be injured than the flexible bond.

The Solid Wire Bond manufactured by The Ohio Brass Company is made of one piece of commercially pure copper.

Code Word	No.	Length, Inches	Capacity B. & S. Gauge	Diameter of Terminal Inches	Length of Terminal under head, Inches	List per 100
<i>Neoplasm.</i>	12117	22	0	1-2	5-8	\$68 10
<i>Neorama.</i>	12118	22	2-0	5-8	5-8	70 60
<i>Neoteric.</i>	12119	22	4-0	3-4	3-4	109 30
<i>Nepenthe.</i>	12120	22	4-0	7-8	3-4	111 80
<i>Geognost.</i>	10515	24	0	1-2	5-8	71 10
<i>Geology.</i>	10516	24	2-0	5-8	5-8	79 30
<i>Geometry.</i>	10517	24	4-0	3-4	3-4	114 70
<i>Geranium.</i>	10518	24	4-0	7-8	3-4	117 20
<i>Germanic.</i>	10519	26	0	1-2	5-8	74 10
<i>Germless.</i>	10520	26	2-0	5-8	5-8	82 90
<i>Getter.</i>	10521	26	4-0	3-4	3-4	120 10
<i>Ghostful.</i>	10522	26	4-0	7-8	3-4	122 60
<i>Ghastly.</i>	10523	28	0	1-2	5-8	77 10
<i>Giantly.</i>	10524	28	2-0	5-8	5-8	86 50
<i>Giblet.</i>	10525	28	4-0	3-4	3-4	125 50
<i>Giddily.</i>	10526	28	4-0	7-8	3-4	128 00

All orders or inquiries for these Bonds should be accompanied with complete specifications called for on page 434.

Above Bonds can be furnished in any desired lengths.

O-B Solid Wire Rail Bonds

Pin Driven Terminal

Type SP



THERE are a number of instances where the Solid Bond will be found of advantage, as in the case of cross-bonding, bonding around joints in mines, or places where it is not possible to place the bond underneath the splice bar. For exposed places, the solid bond is less liable to be injured than the flexible bond.

The Solid Wire Bond manufactured by The Ohio Brass Company is made of one piece of commercially pure copper.

Bonds are furnished complete with Steel Expansion Pins.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal in Inches	Length of Terminal under head in Inches	List per 100
<i>Nubble.</i>	12236	22	0	1-2	5-8	\$68 10
<i>Nubian.</i>	12237	22	2-0	5-8	5-8	70 60
<i>Nubilate.</i>	12238	22	4-0	3-4	3-4	109 30
<i>Nubilose.</i>	12239	22	4-0	7-8	3-4	111 80
<i>Nucament.</i>	12240	24	0	1-2	5-8	71 10
<i>Nuchal.</i>	12241	24	2-0	5-8	5-8	79 30
<i>Nuciform.</i>	12242	24	4-0	3-4	3-4	114 70
<i>Nucleate.</i>	12243	24	4-0	7-8	3-4	117 20
<i>Nuclein.</i>	12244	26	0	1-2	5-8	74 10
<i>Nucleole.</i>	12245	26	2-0	5-8	5-8	82 90
<i>Nucleus.</i>	12246	26	4-0	3-4	3-4	120 10
<i>Nuddle.</i>	12247	26	4-0	7-8	3-4	122 60
<i>Nudicaul.</i>	12248	28	0	1-2	5-8	77 10
<i>Nugatory.</i>	12249	28	2-0	5-8	5-8	86 50
<i>Numbfish.</i>	12250	28	4-0	3-4	3-4	125 50
<i>Numbness.</i>	12251	28	4-0	7-8	3-4	128 00

A variation of $\frac{1}{4}$ inch in length of terminal under head is allowed.

All orders or inquiries for these Bonds should be accompanied with complete specifications called for on page 434.

Above Bonds can be furnished in any desired lengths.

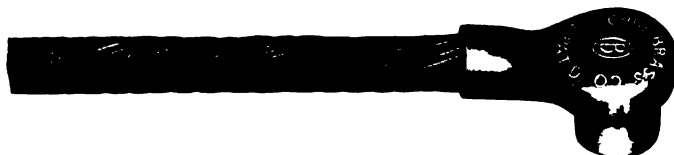
For listing of Steel Expansion Pins, see page 458.

O-B Stub End Terminals

Patented

Compressed and Pin Driven Terminal

Types E and EP



Type E—Compressed Terminal



Type EP—Pin Driven Terminal

CONSISTS of a single terminal with 12 inches of cable extension. Used for connecting lightning arresters and other ground wires to the rail, or for making up extra long bonds for use around special work.

Type E—Compressed Terminal

Code Word	No.	Length of Cable, Inches	Capacity, B. & S. Gauge	Diameter of Terminal in Inches	Length of Terminal under head, Inches	List per 100
<i>Nautical.</i>	12089	12	0	1-2	5-8	\$35 55
<i>Navajoes.</i>	12090	12	0	5-8	5-8	36 80
<i>Navigate.</i>	12091	12	2-0	1-2	5-8	39 65
<i>Nayward.</i>	12092	12	2-0	5-8	5-8	39 65
<i>Nearctic.</i>	12093	12	2-0	3-4	3-4	42 40
<i>Nearhand.</i>	12094	12	4-0	3-4	3-4	57 35
<i>Nearness.</i>	12095	12	4-0	7-8	3-4	58 60

Type EP—Pin Driven Terminal

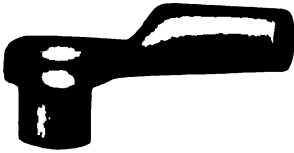
<i>Neatherd.</i>	12096	12	0	1-2	5-8	35 55
<i>Neatify.</i>	12097	12	0	5-8	5-8	36 80
<i>Neatness.</i>	12098	12	2-0	1-2	5-8	39 65
<i>Nebular.</i>	12099	12	2-0	5-8	5-8	39 65
<i>Nebulose.</i>	12100	12	2-0	3-4	3-4	42 40
<i>Nebuly.</i>	12101	12	4-0	3-4	3-4	57 35
<i>Neckband.</i>	12102	12	4-0	7-8	3-4	58 60

For listing of Steel Expansion Pins, see page 458.

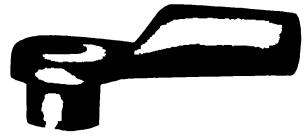
O-B Socket Terminals

Patented

Compressed and Pin Driven Terminal



Compressed Terminal



Pin Driven Terminal

When ordering state whether socket should be drilled for solid or stranded wire.

Compressed Terminal

Code Word	No.	Capacity, B. & S. Gauge	Diameter of Terminal, in Inches	Length of Terminal under head, Inches	List per 100
<i>Nectary.</i>	12103	0	1-2	5-8	\$20 00
<i>Negation.</i>	12104	0	5-8	5-8	25 00
<i>Neglige.</i>	12105	2-0	1-2	5-8	20 00
<i>Negoce.</i>	12106	2-0	5-8	5-8	25 00
<i>Negritic.</i>	12107	2-0	3-4	3-4	30 00
<i>Negroid.</i>	12108	4-0	3-4	3-4	37 50
<i>Nemesis.</i>	12109	4-0	7-8	3-4	42 50

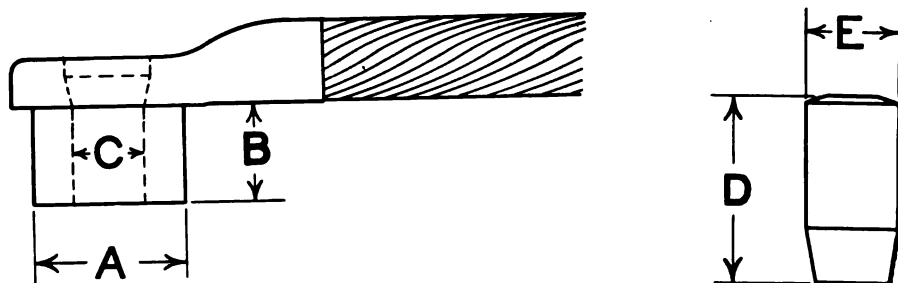
Pin Driven Terminal

<i>Nemoral.</i>	12110	0	1-2	5-8	20 00
<i>Nenuphar.</i>	12111	0	5-8	5-8	25 00
<i>Neocene.</i>	12112	2-0	1-2	5-8	20 00
<i>Neocracy.</i>	12113	2-0	5-8	5-8	25 00
<i>Neogen.</i>	12114	2-0	3-4	3-4	30 00
<i>Neology.</i>	12115	4-0	3-4	3-4	37 50
<i>Neophyte.</i>	12116	4-0	7-8	3-4	42 50

When ordering state whether socket should be drilled for solid or stranded wire.
For listing of Steel Expansion Pins, see page 458.

O-B Steel Expansion Pins

For O-B Pin Driven Bonds



Code Word	No.	E Diameter of Pin, Inches	C Diameter of Hole in Terminal Will Fit, Inches	D Length of Pin, Inches	A Diameter of Bond Terminal Inches	B Length of Bond Terminal under head, Inches	Price per 100
<i>Numeric.</i>	12252	$\frac{1}{4}$	$\frac{9}{16}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{8}$	\$0 50
<i>Nunchion.</i>	12253	$\frac{3}{8}$	$\frac{3}{4}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{8}$	50
<i>Nunciate.</i>	12254	$\frac{7}{16}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{8}$	50
<i>Nunnery.</i>	12255	$\frac{1}{2}$	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{7}{8}$	$\frac{1}{8}$	1 00

Taper Punches

For Pin Driven Bonds



Although these Tools are not necessary to install Pin Driven Bonds, many prefer to use them, as when driven through the holes in the bond terminals before Expansion Pins are inserted, they eliminate any chance of the pin shearing the hole as it is driven home. Made of steel.

Code Word	No.	List Each
<i>Nuptial.</i>	11690—Taper Punch for $\frac{1}{4}$ -inch Terminal, length $3\frac{1}{2}$ inches	\$0 75
<i>Nursery.</i>	11691—“ “ “ “ “ “ “ $3\frac{1}{2}$ “	75
<i>Nutant.</i>	11692—“ “ “ “ “ “ “ 4 “	75
<i>Nutgall.</i>	11693—“ “ “ “ “ “ “ 4 “	75
<i>Nuthatch.</i>	11694—“ “ “ 1 “ “ “ 5 “	75

O-B Removable Mine Bond

Type N—Patent Applied For



DESIGNED for use in bonding temporary tracks only.

Made of flexible copper cable soldered into tapered steel terminals, heavily tinned.

Installation and removal easy—merely driven in or out with hammer—without injury to bond terminals.

Can be used over and over again when tracks are moved from one entry to another, thus making ultimate cost of Bond extremely low.

Tapered terminal broaches hole and makes tight joint—driven in further each time installed.

Code Word	No.	Length, Center to Center of Terminals, Inches	Capacity, B. & S. Gauge	Diameter of Terminal In Inches	List per 100
<i>Nuthook.</i>	12256	22	2-0	5-8	\$75 70
<i>Nutlet.</i>	12257	24	2-0	5-8	79 30
<i>Nutmeg.</i>	12258	26	2-0	5-8	82 90
<i>Nutrient.</i>	12259	28	2-0	5-8	86 50

Above Bonds can be furnished in any desired length.

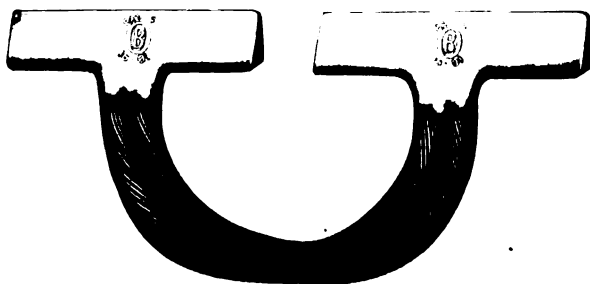
In ordering Bonds give full information as called for on page 434.

O-B Rail Bonds

Patented

Soldered Terminal

Type M



INTENDED for use on outer face of ball of rail. Flexible portion is brought out from lower edge and at center of each terminal, thus distributing all torsional strain equally throughout terminals.

Terminals are tapered with thin edge at top and contact faces are $2\frac{3}{4} \times \frac{9}{16}$ inches on No. 11114 and $2\frac{3}{4} \times \frac{11}{16}$ inches on No. 11115.

Center to center of terminals is $3\frac{1}{4}$ inches and distance from upper edge of terminals to lower edge of loop is $2\frac{1}{8}$ inches.

Code Word	No.	List per 100
Lancer.	11114—Type M Bond 4-0 capacity	\$62 75
Lander.	11115—“ “ 300,000 C. M. capacity	78 80

Above Bond can be furnished in other capacities if desired.

All inquiries or orders for Bonds should give complete specifications as called for on page 434.

For Bonding Tools see pages 481 to 485.

O-B Rail Bonds

Patented

Soldered Terminal

Type HL



DESIGNED for use in bonding around fish plate or for cross-bonding and special work.

Each terminal is 3 inches long and, as overall lengths are given in listing below, a bond of this type should be 6 inches longer than a corresponding bond of the compressed terminal type for use under the same conditions.

Code Word	No.	List per 100
<i>Glassful.</i>	8439—Type HL Bond, length 30 inches, capacity 4-0.....	\$118 75
<i>Glazen.</i>	8441— “ “ “ “ 36 “ “ 4-0.....	134 95
<i>Gleamy.</i>	8443— “ “ “ “ 42 “ “ 4-0.....	151 15

Above Bonds can be furnished in any length and capacity desired.

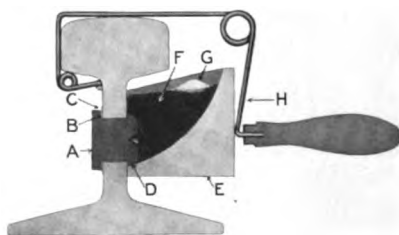
All orders or inquiries should give complete specifications as called for on page 434.

For Bonding Tools see pages 481 and 485.

O-B Thermo Bonding Process

Patent Applied For in U. S. and Canada

AFFORDS a simple and effective means of soldering the terminals of O-B Bonds to the rail after they have been compressed with the O-B Compressor in the ordinary way.



- A—Head of All Wire Bond compressed in rail.
- B—Extra contact surface gained by process.
- C—Fillet of solder sealing joint against moisture.
- D—Non-cracking button head formed by O-B Compressor.
- E—O-B Thermo Cup in position on rail.
- F—O-B Thermo Compound.
- G—O-B Thermo Ignition Powder.
- H—O-B Thermo Clamp holding cup in position.

Following is a list of the materials required for installing 100 bonds by the O-B Thermo Bonding Process:

- 25 lbs. Thermo Compound, Cat. No. 10698.
- $\frac{1}{2}$ lb. O-B Thermo Ignition Powder, Cat. No. 10699.
- 10 boxes O-B Thermo Ignition Matches, Cat. No. 10700.
- $7\frac{1}{2}$ lbs. Half and Half Wire Solder, Cat. No. 1691.
- 1 lb. Celerity Soldering Salts, Cat. No. 9732.

The tools required in addition to those regularly used in putting on compressed terminal bonds in the ordinary manner, are as follows: Tinning Irons, Thermo Cups (two additional Cups for every 100 bonds installed), Clamps for Thermo Cups, Flat Paint Brush, Facing Tools or Grinding Machine. A simple charcoal tinner's furnace is recommended for heating the tinning irons, but any type of suitable furnace can be used.

Direction Booklet giving full details of this Process will be mailed on request.

O-B Thermo Bonding Process

Patent Applied for in U. S. and Canada

Continued



Thermo Supply Kit No. 10761

NOTE—The Thermo Supply Kit, as listed below, does not include any of the supplies shown in the illustration.

Code Word	No.	List Price
<i>Imaginal.</i>	10698—O-B Thermo Compound, 10-lb. can.....	per lb. \$ 0 55
<i>Imband.</i>	10699—“ Ignition Powder, ¼-lb. can.....	“ 2 75
<i>Imbank.</i>	10700—“ “ Matches, box of 20.....	per box 03
<i>Imbase.</i>	10701—“ “ Cups.....	each 70
<i>Inunited.</i>	11087—“ “ Clamp for Tee Rail.....	“ 80
<i>Imbosk.</i>	10703—“ “ “ Girder Rail.....	“ 55
<i>Enchant.</i>	1691—Half & Half Wire Solder, No. 10 B. & S. 68 lb. per Spool, per lb.	70
<i>Encore.</i>	9732—Celerity Soldering Salts, 1 lb. bottle.....	each 55
<i>Imbrue.</i>	10761—O-B Thermo Supply Kit (without supplies).....	“ 13 20
<i>Imitable.</i>	10710—1-inch Flat Paint Brush.....	“ 55
<i>Immanity.</i>	10704—¾x1½-inch Facing Tool for ¾-inch Terminal Bonds...	“ 6 60
<i>Immature.</i>	10705—¾x1½-inch Facing Tool for ¾-inch “ “ “	“ 6 60
<i>Immure.</i>	10706—¾x1½-inch Facing Tool for ¾-inch “ “ “	“ 6 60
<i>Lanyard.</i>	11237—¾x1½-inch Tinning Iron for ¾-inch “ “ “	“ 4 95
<i>Lapboard.</i>	11238—¾x1½-inch Tinning Iron for ¾-inch “ “ “	“ 4 95
<i>Lapicide.</i>	11239—¾x1½-inch Tinning Iron for ¾-inch “ “ “	“ 4 95

A grinding machine may be used to brighten web of rail in place of Facing Tools listed above. For re-bonding work a proper sized Tapered Reamer as listed on page 479 should be used also.

Regular bonding tools for compressing bonds and drilling holes, etc., are listed on the following pages.

O-B Rail Bonds

Patented

Type J—For Ball of Rail

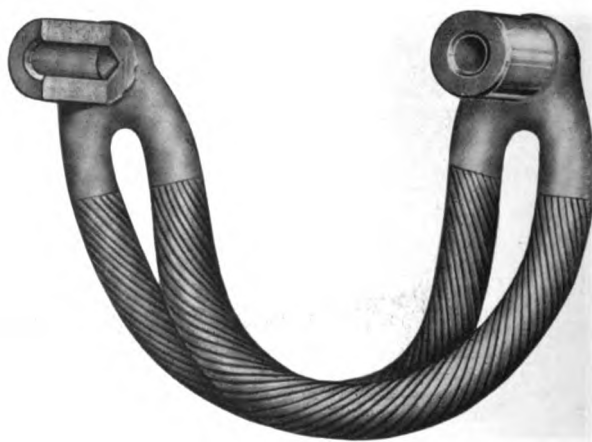


Fig. 1—Type J Bond with one Terminal Sectioned



Fig. 2—Hole in Rail

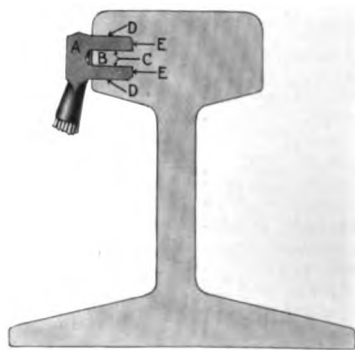


Fig. 3—Bond Terminal Installed

See page 467 for listing.

O-B Rail Bonds

Patented

Type J—For Ball of Rail

Continued

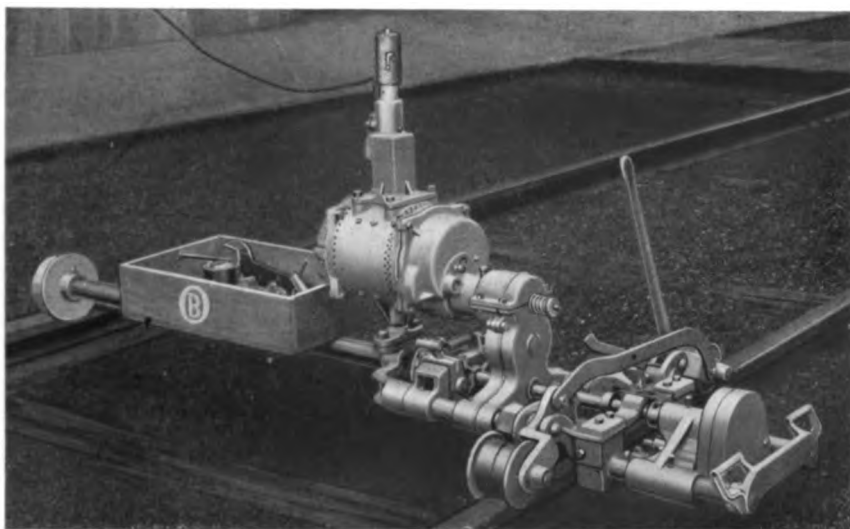


Fig. 4—Milling Machine with Motor

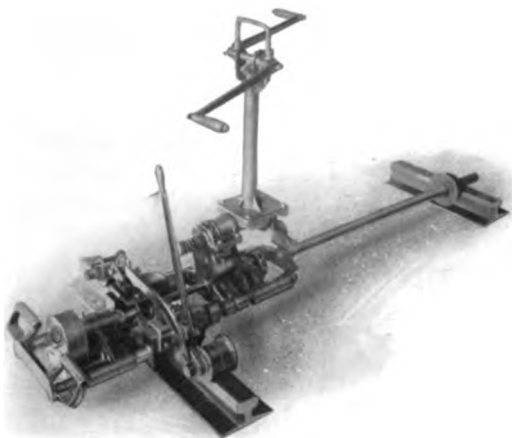


Fig. 5—Hand Operated Milling Machine



Fig. 6—Milling Cutter

See page 466 for description and page 467 for listing.

O-B Rail Bonds

Patented

Type J—For Ball of Rail

Continued

THIS Bond possesses distinctive features in the shape of terminals and the method of making contact with the rail. It is installed in an annular hole milled in the ball of the rail with a hollow cutter which leaves a pin in the center of the hole. This pin is an integral part of the rail and makes contact with the inside of the bond terminal.

The hole in rail is shown in Fig. 2 and a sectional view of the Bond terminal installed in Fig. 3. Contact surfaces (C, D and E) furnish more contact than is needed for the capacity of the bond.

Bond is installed by driving terminal in hole with an ordinary hammer, the force of the blows being sufficient to expand the copper into intimate contact with the rail.

The motor driven machine shown in Fig. 4 mills two holes in the rail simultaneously. Operation is very rapid. The cutters are fed in automatically and backed out without stopping the motor. Two men can operate the machine while a third cleans the holes, installs Bonds, etc. Machine is mounted on truck and can be quickly moved from joint to joint.

Machine is furnished complete with motor, rubber cover for motor, wrenches, reamer for brightening holes in bond terminals and a spray can with rubber tubing attached, for cleaning chips and oil out of holes in rail.

Motor operates on 600 volts D. C. and is especially designed for this service. Switch is on top of machine within easy reach of operator.

For special conditions, where power is not available or where only a few bonds are to be installed, it may be desirable to use the machine shown in Fig. 5. It differs from the motor driven machine only in the substitution of handles for the motor. The hand attachment is also furnished to be put on a machine in place of motor.

See page 467 for listing.

O-B Rail Bonds

Patented

Type J—For Ball of Rail

Continued

Cutters shown in Fig. 6 are made of high speed steel. They can be quickly and accurately reground by means of grinder No. 11442 which is fitted with special jig as shown in Figs. 7 and 8.



Fig. 7—Grinding Face of Cutter



Fig. 8—Grinding Flutes in Cutter

Type J Bonds can be installed on standard tee rails weighing 60 pounds or more per yard.

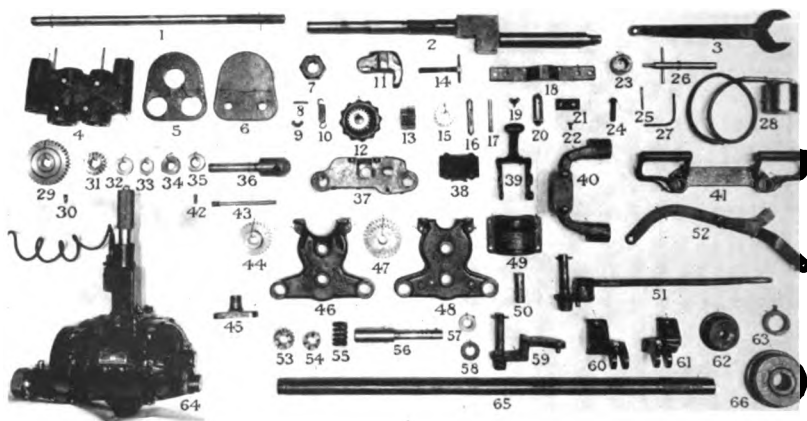
Hole in rail is $\frac{3}{8}$ inch in diameter and $\frac{3}{8}$ inch deep. Type J Bond terminal has $\frac{1}{4}$ -inch hole for reception of stud. Capacity of Bond, 4/0; unformed length, 7 inches.

Code Word	No.	List Price
<i>Nutting.</i>	11439—Type J Bond, capacity 4-0	per 100 \$ 66 50
<i>Nymphal.</i>	11441—Milling Cutter	each 2 75
<i>Nymphean.</i>	11440—Milling Machine with Motor	" 715 00
<i>Oakling.</i>	11624—Milling Machine Hand Operated	" 396 00
<i>Oarfool.</i>	11634—Motor only, 550 volts	" 363 00
<i>Oarsman.</i>	11625—Hand attachment only	" 44 00
<i>Oatcake.</i>	11442—Cutter Grinder with Jig	" 41 80

Motor Driven Milling Machine

For Type J Bonds

List of Repair Parts



Code Word

No. Part

<i>Oatmeal.</i>	12260— 1—Driving Shaft.....
<i>Obduct.</i>	12261— 2—Guide Bar.....
<i>Obdurate.</i>	12262— 3—Clamping Wrench.....
<i>Obelisk.</i>	12263— 4—Spindle Frame with Oilers and Bushings.....
<i>Obesity.</i>	12264— 5—Spindle Gear Case—Back.....
<i>Obeyer.</i>	12265— 6—Spindle Gear Case—Cover.....
<i>Obfirm.</i>	12266— 7—Clamping Nuts.....
<i>Obiler.</i>	12267— 8—Feed Lever Spring Stud.....
<i>Obitual.</i>	12268— 9—Feed Lever Spring Thumb Nut.....
<i>Obituary.</i>	12269—10—Feed Lever Spring.....
<i>Objector.</i>	12270—11—Front Rail Clamp.....
<i>Oblation.</i>	12271—12—Hand Wheel Feed Gear.....
<i>Obligee.</i>	12272—13—Feed Idler Gears.....
<i>Oblivion.</i>	12273—14—Leveling Screw.....
<i>Obolary.</i>	12326—14-A—Lock Nut for Leveling Screw.....
<i>Obolize.</i>	12274—15—Feed Gear with Key.....
<i>Obovate.</i>	12275—16—Feed Gear Idler Shaft.....
<i>Obrogate.</i>	12276—17—Feed Lever Rocker Shaft.....
<i>Obscure.</i>	12277—18—Top Connecting Plate.....
<i>Obsequy.</i>	12278—19—Depth Gauge Thumb Screw.....
<i>Observe.</i>	12279—20—Depth Gauge.....
<i>Observer.</i>	12280—21—Clamping Jaw.....
<i>Obsidian.</i>	12281—22—Screw for Clamping Jaw.....
<i>Obstacle.</i>	12282—23—Spacing Collar.....
<i>Obstancy.</i>	12283—24—Truck Support Shaft.....
<i>Obtected.</i>	12284—25—No. 4 Taper Pin.....

Motor Driven Milling Machine

For Type J Bonds

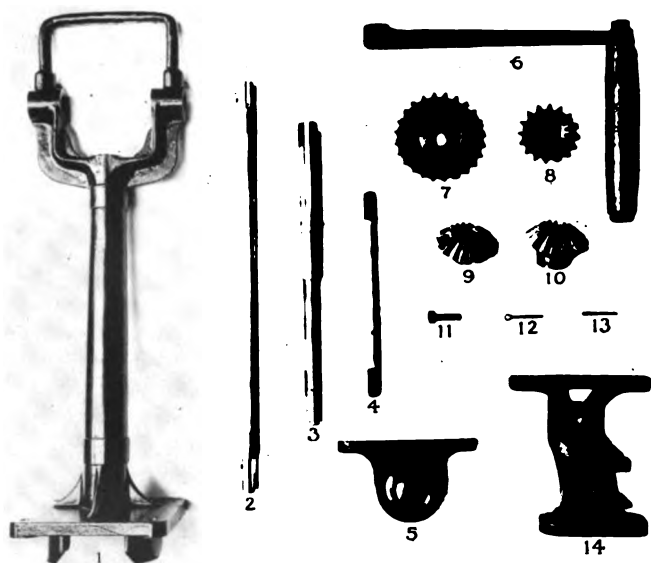
List of Repair Parts—Continued

Code Word	No.	Part
<i>Obtend.</i>	12285—26—	Socket Wrench.....
<i>Obtunder.</i>	12286—27—	Bond Terminal Reamer.....
<i>Obtuse.</i>	12287—28—	Gasoline Spray Can and Tube.....
<i>Obtusion.</i>	12288—29—	Spindle Driving Gear with Key.....
<i>Obtusity.</i>	12289—30—	Spindle Frame Oil Cup.....
<i>Obuncous.</i>	12290—31—	Spindle Pinion with Key.....
<i>Obverse.</i>	12291—32—	Depth Gauge Collar and Screw.....
<i>Obviate.</i>	12292—33—	Spindle Collar and Screw.....
<i>Occamy.</i>	12293—34—	Driving Shaft Collar and Screw.....
<i>Occasive.</i>	12294—35—	Ball Thrust Bearing.....
<i>Occident.</i>	12295—36—	Chuck Spindle.....
<i>Occision.</i>	12296—37—	Feed Gear Frame.....
<i>Occult.</i>	12297—38—	Feed Gear Frame Cover.....
<i>Occupant.</i>	12298—39—	Feed Lever.....
<i>Occupier.</i>	12299—40—	Rear Yoke.....
<i>Oceanic.</i>	12300—41—	Front Cross Piece.....
<i>Ocellary.</i>	12301—42—	Chuck Set Screw.....
<i>Ocellate.</i>	12302—43—	Cutter Adjusting Screw.....
<i>Ocelot.</i>	12303—44—	Motor Driving Gear with Key.....
<i>Octagon.</i>	12304—45—	Motor Support.....
<i>Octave.</i>	12305—46—	Motor Gear Case—Back.....
<i>Octene.</i>	12306—47—	Motor Idler Gears.....
<i>Octodont.</i>	12307—48—	Motor Gear Case—Front.....
<i>Octofid.</i>	12308—49—	Motor Gear Case—Cap.....
<i>Octogild.</i>	12309—50—	Motor Idler Gear Shaft.....
<i>Octopus.</i>	12310—51—	Long Truck Lever with Handle and Shaft.....
<i>Octylene.</i>	12311—52—	Truck Cross Arm with Locking Dog.....
<i>Ocular.</i>	12312—53—	Motor Driving Clutch Pinion.....
<i>Oculary.</i>	12313—54—	Safety Clutch Collar with Keys.....
<i>Oculist.</i>	12314—55—	Safety Clutch Spring.....
<i>Oddity.</i>	12315—56—	Motor Driving Spindle.....
<i>Oddness.</i>	12316—57—	Safety Clutch Adjusting Nut with Screw.....
<i>Odontoid.</i>	12317—58—	Truck Wheel Washer.....
<i>Odorant.</i>	12318—59—	Short Truck Lever with Shaft.....
<i>Odorine.</i>	12319—60—	Truck Support—Right Hand.....
<i>Odorous.</i>	12320—61—	Truck Support—Left Hand.....
<i>Odyssey.</i>	12321—62—	Front Truck Wheel.....
<i>Offender.</i>	12322—63—	Rear Truck Wheel Collar with Screw.....
<i>Offish.</i>	12323—64—	600 Volt D. C. Interpole Motor.....
<i>Offskip.</i>	12324—65—	Truck Pipe.....
<i>Offscum.</i>	12325—66—	Rear Truck Wheel.....

Hand Attachment for Milling Machine

For Type J Bonds

List of Repair Parts



Code Word

	No.	Part
<i>Ogress.</i>	12327—	1—Upright Casting.....
<i>Oilbird.</i>	12328—	2—Vertical Drive Shaft.....
<i>Oilery.</i>	12329—	3—Horizontal Drive Shaft.....
<i>Oilskin.</i>	12330—	4—Crank Shaft.....
<i>Ointment.</i>	12331—	5—Bearing Casting.....
<i>Okenite.</i>	12332—	6—Crank Handle.....
<i>Oldish.</i>	12333—	7—Bevel Gear for Bottom Vertical Shaft.....
<i>Oleander.</i>	12334—	8—Bevel Gear for Horizontal Shaft.....
<i>Oleaster.</i>	12335—	9—Bevel Gear for Crank Shaft.....
<i>Olefiant.</i>	12336—	10—Bevel Gear for Top Vertical Shaft.....
<i>Oleone.</i>	12337—	11—Cap Screw.....
<i>Olibene.</i>	12338—	12—Cotter Pin.....
<i>Oligist.</i>	12339—	13—Taper Pin.....
<i>Olitory.</i>	12340—	14—Support Bracket Casting.....

Rail Bond Compressor

For Tee and Girder Rails



Nos. 5438-5439

IS of compound screw type, outer screw serving to press terminal of bond tightly against web of rail, after which inner screw is tightened up by means of a long wrench, thus expanding terminal in rail.

Cup point of inner screw prevents terminal from cracking and produces a finished button on projecting end of terminal.

Both screws are made of best quality steel and ends are hardened.

Nos. 5438 and 5439 are equipped with carrying handles and leveling screws as shown above. No. 5437 has leveling screws but no handles, while No. 9982 has neither leveling screws or handles.

No. 9982 can be used with bond terminals up to and including $\frac{3}{8}$ inch in diameter only; other compressors with any size terminal up to and including 1 inch diameter.

One wrench supplied with each compressor unless otherwise specified.

Code Word	No.	List Each
<i>Glorify.</i>	9982—Extra small size, for Tee Rails only, 3 inches or less in height	\$49 50
<i>Glosser.</i>	5437—Small " " " " " 5 " " " "	55 00
<i>Glossy.</i>	5438—Medium size for Tee or Girder Rails, 7 " " " " "	66 00
<i>Glover.</i>	5439—Large " " " " " over 7 inches in height	77 00
<i>Glumly.</i>	5209—Wrench, for extra small Compressor, only	4 40
<i>Glutton.</i>	8303—" " " " " small, medium and large Compressors	6 60

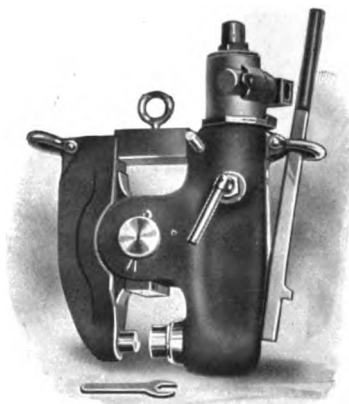
Extra Parts

<i>Landlord.</i>	11196—Inner Screw for Extra Small Compressor No. 9982	\$20 90
<i>Landman.</i>	11197—Outer " " " " " 9982	17 60
<i>Landtag.</i>	11198—Inner " " " " " Small Compressor, No. 5437	23 10
<i>Langate.</i>	11199—Outer " " " " " 5437	19 80
<i>Langued.</i>	11200—Inner " " " " " Medium and Large Compressors Nos. 5438-5439	26 40
<i>Languish.</i>	11201—Outer Screw for Medium and Large Compressors Nos. 5438-5439	22 00

Prices for Compressors given above include Wrench.

Hydraulic Rail Bond Compressor

Quick Release Type—For Tee Rails



THE use of this Compressor for compressing terminals of O-B Rail Bonds in rail insures excellent results.

Compressor can be set, bond compressed and Compressor removed in an extremely short time.

A gauge is placed upon rail with a pin inserted in bond hole and a chalk mark made on ball of rail to center Compressor over bond.

Removal of block at upper end of jaws permits lower ends to open $3\frac{1}{2}$ inches for placing in position on rail. Jaws are then closed and block replaced.

Surrounding the ram is a spring actuated sleeve which forces flange of bond terminal into contact with web of rail.

Ram is cup shaped, confining copper in hole and not permitting it to spread over web of rail outside of hole.

A quick action release makes possible rapid removal from rail.

For $\frac{7}{8}$ -inch diameter terminals 25 ton capacity is recommended.

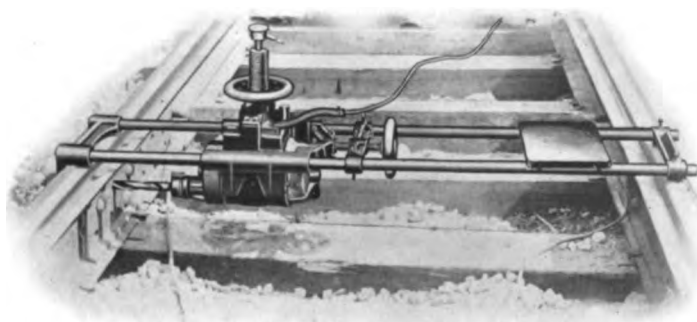
For 1-inch diameter terminals or larger 35 ton capacity is recommended.

Height of Compressor opening above center of ram, $3\frac{1}{2}$ inches.

Weight of No. 10470 is 175 pounds. Weight of No. 11388 is 210 pounds.

Code Word	No	List Each
Globe.	10470—Compressor, 25 ton capacity	\$440 00
Langour.	11388—“ 35 “ “	495 00

Duntley Electric Track Drill



AN efficient tool for rapidly drilling holes for bonding in web of either tee or girder rails. Will drill holes up to 1 inch in diameter. Operates on 600 volt D. C. Circuits.

Frame does not bolt to track, being merely hooked over one rail. Operator holds down the other end by sitting on the seat which places him in a convenient position to operate feed nut.

Spindle is at bottom, permitting drilling holes close to ties without using an angle attachment. Holes are located vertically by means of adjusting screws.

Cross bar carrying feed nut is located on the horizontal rods by means of eye pins which may be easily withdrawn for quick removal of drill.

A series of holes in the horizontal rods permits adjustment for varying lengths of drill bits.

Drill may be removed from frame and used as an independent tool by removing four cap screws.

Weight, 140 pounds.

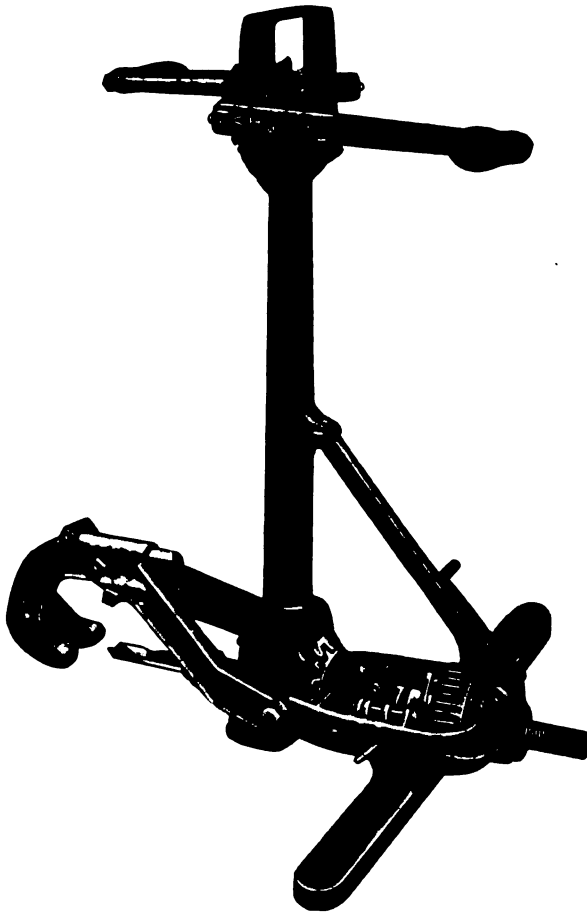
Code Word	No.	List Each
Oliver.	11635—Electric Drill, with No. 3 Morse Taper Socket	\$495 00

An Adaptor for Drills having other than Morse Taper Shanks can be furnished to order.

Moore Track Drills

For Tee and Girder Rails

Nos. 1, 2 and 3



Nos. 1 and 2 Drills for Tee Rails

See description and listing on opposite page.

Moore Track Drills

For Tee and Girder Rails

Nos. 1, 2 and 3—Continued

MADE with detachable upright or standard which is quickly erected and rigidly secured to frame by shifting of one lever and can be instantly released by it.

Upright and rail hooks can be removed to allow trains to pass and quickly replaced, ready to continue drilling without disturbing the drill. Can be easily carried by one man when separated, one part in each hand.

Numbers 1 and 2 Drills are exactly similar except that the No. 2 is of heavier construction throughout. Both No. 1 and No. 2 Drills are equipped with an automatic flexible feed mechanism which has a range of from 1 inch advance of spindle for every 50 revolutions to 1 inch advance for every 650 revolutions. This adjustment meets any and all conditions of hard or soft rails, takes care of large or small drill bits and overcomes the difficulties encountered in hard drilling and breaking of bits.

No. 3 Drill is the latest development, is extremely simple and has a much smaller number of working parts than the Nos. 1 and 2. One man can operate this Drill when drilling holes from $\frac{5}{8}$ inch to $\frac{7}{8}$ inch, while two men are required for drilling holes from 1 inch to $1\frac{1}{4}$ inches. This Drill is very strong and compact. The feed mechanism is plain gearing, exposed to view of operator at all times. The feed mechanism permits three changes as follows: 120 turns of crank to 1 inch advance of drill bit; 180 turns of crank to 1 inch advance of drill bit and 360 turns of crank to 1 inch advance of drill bit.

The No. 3 Drill is recommended as being the most satisfactory for all-around electric railway and mine haulage requirements.

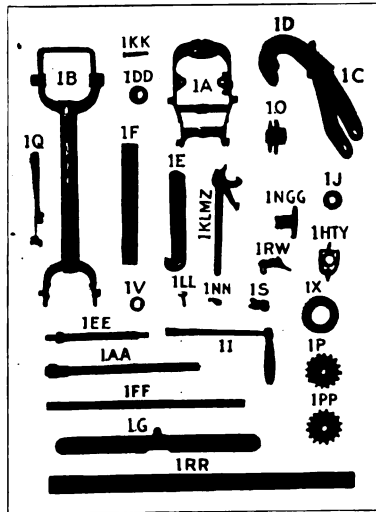
All Drills are regularly furnished complete with a standard chuck which takes a $\frac{3}{4}$ -inch uniform round shank twist drill and will drill holes up to $1\frac{1}{4}$ inches in diameter. A $\frac{3}{4}$ -inch bit is included with each Drill.

Code Word	No.	List Each
<i>Gnarled.</i>	10133—No. 1 Drill for Tee Rails, weight 60 lbs.	\$36 30
<i>Gnawer.</i>	10134—No. 1 " Girder Rails, weight 65 lbs.	41 80
<i>Impedite.</i>	10717—No. 2 " Tee Rails, weight 80 lbs.	41 80
<i>Impellent.</i>	10718—No. 2 " Girder Rails, weight 85 lbs.	47 30
<i>Olivine.</i>	12341—No. 3 " Tee Rails, weight 60 lbs.	35 20
<i>Olympic.</i>	12342—No. 3 " Girder Rails, weight 65 lbs.	40 70

See Lists of Parts on the following pages.

Moore Track Drills

List of Repair Parts for No. 1 Drill



For No. 1 Drill for Tee Rails, No. 10133

Code Word	No.	Part	List Each
Gobbler.	10135—1A	Base with Feed Bracket Pin and Bolt.	\$5 50
Goblet.	10136—1B	Upright Frame.	6 60
Goblin.	10137—1C	Rail Hook Arm, R. and L. (2 per set).	1 80
Goggled.	10138—1D	" " for Standard Rail.	1 35
Gondola.	10139—1G	Foot Plate.	1 10
Goodly.	10140—1HTY	Shifting Lever, complete.	2 75
Goodness.	10141—1I	Crank with Wood Handle and Bolt (2 per set).	1 10
Gopher.	10142—1J	Ball-Bearing Adjusting Nut.	2 20
Gorged.	10143—1KLMZ	Back Brace, complete.	2 75
Gorgeous.	10144—1NGG	Clutch Flange and Spring.	2 45
Gosling.	10145—1O	Feed Nut.	2 75
Gossip.	10146—1P	Gear for Spindle with Key, $1\frac{1}{8}$ -inch Bore.	1 10
Gothic.	10147—1RW	Feed Lever with Link and Pin.	1 10
Gowned.	10148—1S	" Bracket with Roll and Stud.	70
Grabber.	10149—1V	Clutch Collar and Key.	1 10
Gracious.	10150—1X	Feed Nut Case.	1 65
Gradely.	10151—1AA	Spindle with Set Screw.	5 50
Gradient.	10152—1DD	Ball-Bearing Complete.	2 20
Graduate.	10153—1EE	Crank Shaft with Collar.	1 65
Grainer.	10154—1FF	Vertical Shaft, Keyseated.	2 20
Graining.	10155—1KK	Clutch Collar Spring and Bolt.	35
Grammer.	10156—1LL	Feed Adjusting Screw.	55
Granary.	10157—1NN	" Dog.	55
Grandly.	10159—1PP	Gear, $\frac{1}{2}$ -inch Bore, Keyseated (3 per set).	1 10
Grange.	10160—1GG	Feed Dog Spring.	25

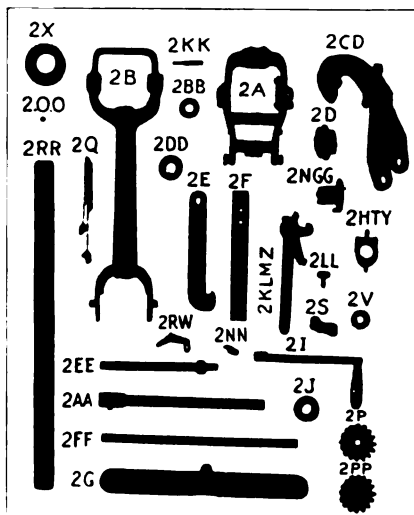
For No. 1 Drill for Girder Rails, No. 10134

The above parts are for use with Drill for Girder Rails also, with the exception of the Rail Hook which is listed below:

Granule.	10161—High Rail Hook for Girder Rails.	\$5 50
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Moore Track Drills

List of Repair Parts for No. 2 Drill



For No. 2 Drill for Tee Rails, No. 10717

Code Word	No.	Part	List Each
<i>Impeople.</i>	10719—2A	Base with Feed Bracket Pin and Bolt.....	\$7 15
<i>Implead.</i>	10720—2B	Upright Frame.....	8 80
<i>Implere.</i>	10721—2C	Rail Hook Arm, R. & L.....	2 45
<i>Imporous.</i>	10722—2D	" " for Standard Rail.....	2 00
<i>Imposer.</i>	10723—2G	Foot Plate.....	1 45
<i>Imposing.</i>	10724—2HTY	Shifting Lever, complete.....	3 85
<i>Impost.</i>	10725—2I	Crank with Wood Handle and Bolt (2 per set)....	1 65
<i>Imposter.</i>	10726—2J	Ball-Bearing Adjusting Nut.....	2 20
<i>Impotent.</i>	10727—2KLMZ	Back Brace, complete.....	3 85
<i>Imprison.</i>	10728—2NGG	Clutch Flange and Spring.....	3 30
<i>Impudent.</i>	10729—2O	Feed Nut.....	3 85
<i>Impugn.</i>	10730—2P	Gear for Spindle with Key, 1½-inch Bore.....	1 45
<i>Inaction.</i>	10731—2RW	Feed Lever with Link and Pin.....	1 45
<i>Inanity.</i>	10732—2S	" Bracket with Roll and Stud.....	90
<i>Inaurate.</i>	10733—2V	Clutch Collar with Key.....	1 45
<i>Inboard.</i>	10734—2X	Feed Nut Case.....	2 20
<i>Inburst.</i>	10735—2AA	Spindle with Set Screw.....	7 15
<i>Incanton.</i>	10737—2DD	Ball Bearing, complete.....	2 75
<i>Incense.</i>	10738—2EE	Crank Shaft with Collar.....	2 20
<i>Inceptor.</i>	10739—2FF	Vertical Shaft, Keyseated.....	3 30
<i>Incertum.</i>	10740—2KK	Clutch Spring with Bolt.....	35
<i>Incident.</i>	10741—2LL	Feed Adjusting Screw.....	55
<i>Incisor.</i>	10742—2NN	" Dog.....	55
<i>Inclasp.</i>	10744—2PP	Gear, 1-inch Bore, Keyseated (3 per set).....	1 45
<i>Incliner.</i>	10745—2GG	Feed Dog Spring.....	25

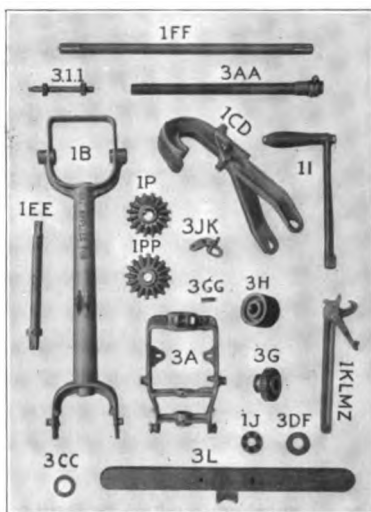
For No. 2 Drill for Girder Rails, No. 10718

The above parts are for use with Drill for Girder Rails also, with the exception of the Rail Hook which is listed below.

Inclip. 10746—Rail Hook for Girder Rails.....\$5 50

Moore Track Drills

List of Repair Parts for No. 3 Drill



For No. 3 Drill for Tee Rails, No. 12341

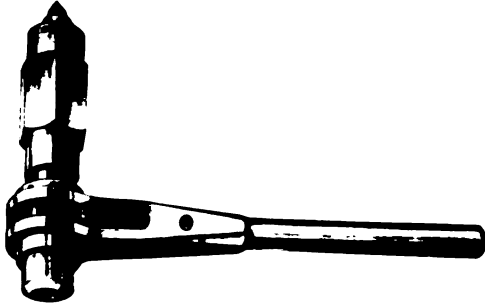
Code Word	No.	Part	List Each
<i>Omegoid.</i>	12343—3A	Base with Bolt.....	\$5 50
<i>Omelet.</i>	12344—1B	Upright Frame.....	6 60
<i>Omened.</i>	12345—1C	Rail Hook Arm, R. and L.....	1 80
<i>Ominous.</i>	12346—1D	Rail Hook.....	1 35
<i>Omissive.</i>	12347—3DF	Friction Washer.....	35
<i>Omitter.</i>	12348—3G	Feed Nut, 36 teeth.....	2 75
<i>Omniety.</i>	12349—3H	Assembled 33, 34 and 35-tooth gear.....	4 95
<i>Omoplate.</i>	12350—1I	Crank with wood handle and bolt (2 per set).....	1 10
<i>Oncidium.</i>	12351—1J	Ball-bearing Adjusting Nut.....	2 20
<i>Oneidas.</i>	12352—3JK	Shifting Gear Bracket and Lever.....	1 65
<i>Oneness.</i>	12353—1KLMZ	Back Brace, complete.....	2 75
<i>Oneself.</i>	12354—3L	Foot Plate.....	1 10
<i>Ongoing.</i>	12355—1P	Gear for Spindle with Key $1\frac{1}{4}$ -inch bore.....	1 10
<i>Ontogeny.</i>	12356—3AA	Spindle with Set Screw.....	5 50
<i>Opacity.</i>	12357—3CC	Fiber Washer.....	25
<i>Opalesce.</i>	12358—1EE	Crank Shaft with Collar.....	1 65
<i>Opalize.</i>	12359—1FF	Vertical Shaft, Keyseated.....	2 20
<i>Opelet.</i>	12360—3GG	Feed Dog Spring.....	25
<i>Opener.</i>	12361—3II	Gear Shaft, 12 teeth on each end.....	2 20
<i>Operand.</i>	12362—1PP	Gear, $\frac{1}{2}$ -inch bore, keyseated (3 per set).....	1 10

For No. 3 Drill for Girder Rails, No. 12342

The above parts are for use with Drill for Girder Rails also, with the exception of the Rail Hook which is listed below.

Inclp. 10746—Rail Hook for Girder Rails.....\$5 50

Hand Ratchet Drill



SUITABLE for drilling holes from $\frac{5}{8}$ to 1 inch diameter in steel rails for bonding purposes.

Polished steel finish. Length of handle, 15 inches. Weight, 10 pounds.

Code Word	No.	List Each
<i>Operetta.</i>	11636—Drill No. 3, Morse Square Socket.....	\$14 30
<i>Opelide.</i>	11637— " " " Taper "	17 60

Tapered Reamers



MADE with six flutes, and are especially adapted for reaming high carbon steel rails.

Provided with a straight shank $\frac{1\frac{1}{4}}$ of an inch in diameter and $2\frac{1}{4}$ inches long. Length 6 inches.

Code Word	No.						List Each
<i>Greusome.</i>	8160—	$\frac{1}{2}$ -inch	Tapered	Reamer for	Reaming	$\frac{1}{4}$ -inch holes	\$4 95
<i>Impaint.</i>	10707—	$\frac{1}{2}$	"	"	"	"	4 95
<i>Griddle.</i>	8164—	$\frac{1}{2}$	"	"	"	"	4 95
<i>Impalsy.</i>	10708—	$\frac{1}{2}$	"	"	"	"	4 95
<i>Gridiron.</i>	8225—	$\frac{1}{2}$	"	"	"	"	4 95
<i>Imparter.</i>	10709—	$\frac{1}{2}$	"	"	"	"	4 95
<i>Lapulan.</i>	11210—	1	"	"	"	"	5 50
<i>Lapwork.</i>	11211—	1	"	"	"	"	5 50

Uniform Round Shank Twist Drills

Carbon Steel



SHANK, $2\frac{1}{4}$ inches long, approximately $\frac{5}{8}$ of an inch in diameter (actual diameter .647 of an inch). Length of drill 6 inches.

Code Word	No.	List Each
<i>Grapple.</i>	2953—Twist Drill, Diameter $\frac{1}{2}$ -inch.....	\$0 75
<i>Grasper.</i>	2955— " " " $\frac{1}{8}$ "	80
<i>Gratuity.</i>	2957— " " " $\frac{3}{8}$ "	85
<i>Greaser.</i>	2961— " " " $\frac{1}{2}$ "	1 00
<i>Greenery.</i>	2965— " " " $\frac{3}{4}$ "	1 15
<i>Grenade.</i>	2969— " " " 1 "	1 40

Uniform Round Shank Flat Drills

High Speed Steel



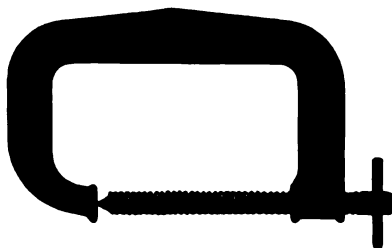
SHANK, $2\frac{1}{4}$ inches long, approximately $\frac{5}{8}$ of an inch in diameter (actual diameter .647 of an inch). Length of drill 6 inches.

Code Word	No.	List Each
<i>Lapidary.</i>	11202—Flat Drill, Diameter $\frac{1}{2}$ -inch.....	\$1 65
<i>Lapidate.</i>	11203— " " " $\frac{3}{8}$ "	1 80
<i>Lapidify.</i>	11204— " " " $\frac{5}{8}$ "	1 90
<i>Lapper.</i>	11205— " " " $\frac{3}{4}$ "	2 10
<i>Lapping.</i>	11206— " " " $\frac{7}{8}$ "	2 20
<i>Lapsable.</i>	11207— " " " 1 "	2 65

Bonding Clamps

For O-B Soldered Rail Bonds

Continued

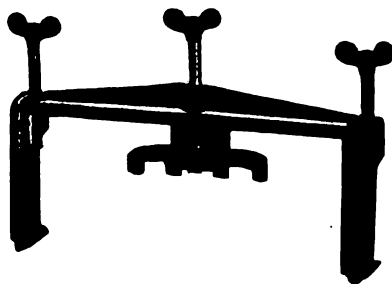


No. 8450—Clamp for Type HL Bonds

This Clamp is used in the application of the Type HL Soldered Bonds.

Code Word
Grizzle.

No.	List Each
8450—Clamp for Type HL Bonds.....	\$3 30



No. 10018—Clamp for Type M Bonds

This Clamp is used in the application of Type M Bonds.

Code Word
Groanful.

No.	List Each
10018—Clamp for Type M Bonds.....	\$6 60

Magic Drill Grinder



BY means of this device, twist drills may readily be resharpened and as it is portable, this operation may be done by the bonding crew out on the line and its use insures a constant supply of sharp drills.

A screw clamp with a wide range of adjustment makes it possible to attach the device firmly to any convenient support.

The Grinder is very durable and compact and the gears are machine milled and run in oil in a tight casing.

The Carborundum Wheel is carried on bronze bearings and runs at a high speed so that twist drills may be sharpened quickly and accurately by means of an automatic attachment provided for this purpose.

An adjustable rest for use in grinding chisels and other tools is furnished without extra charge.

The device is furnished complete with Carborundum Wheel as shown above and weighs 18 lbs.

Code Word	No.	List Each
<i>Includ.</i>	10645—Magic Drill Grinder.....	\$37 40
<i>Incoach.</i>	10646—Carborundum Wheel, 8-inch diameter, 1-inch Face.....	5 30

Above Grinder, equipped with special jigs for grinding Milling Cutters for Type J Bonds is listed on page 467.

Electric Grinding Machine and Emery Wheel

Portable



THIS is a powerful device and is giving satisfactory service to a number of Electric Railways. The weight of the motor is only 35 pounds and it is equipped with handles so it can be readily used.

The speed of the motor is 4000 r. p. m. and the 5-inch diameter emery wheel, as listed below, should be used, as it gives a suitable peripheral velocity for rail grinding. While rated at $\frac{1}{2}$ h. p. the motor will develop full $\frac{3}{4}$ h. p.

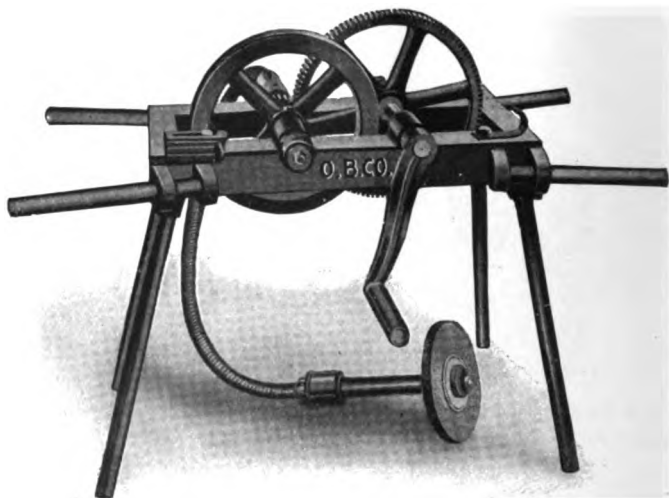
The armature shaft revolves on ball bearings, thus reducing friction and wear to a minimum.

With each motor is included a starting resistance which is not only arranged for starting but is suitable for cutting down the voltage, as many railways use a voltage somewhat above 500 volts at power houses and substations in order to have a satisfactory voltage at distant points of the line. This resistance is arranged so that it can be left in series with the motor and yet the arrangement is such that a "no voltage release" feature is incorporated regardless of the amount of resistance being used.

A convenient arrangement of the apparatus is to use a pole with a metal hook on one end which is hooked over the trolley wire and the insulated line wire is brought down this pole to the starting resistance which can be mounted on the lower end of the pole. Thus the operator has only the motor and the starting box with the pole to carry from joint to joint.

Code Word	No.	List Each
<i>Impaste.</i>	10592—Grinding Machine, without Emery Wheel.	\$176 00
<i>Impearl.</i>	10593—Emery Wheel, 5-inch diameter, $\frac{3}{4}$ -inch Face.	2 00

Hand Power Grinding Machine



USED to grind and polish surface of rails for application of soldered bonds.

Simple, compact and strong.

Can be readily carried from joint to joint by two men.

Frame is made entirely of iron.

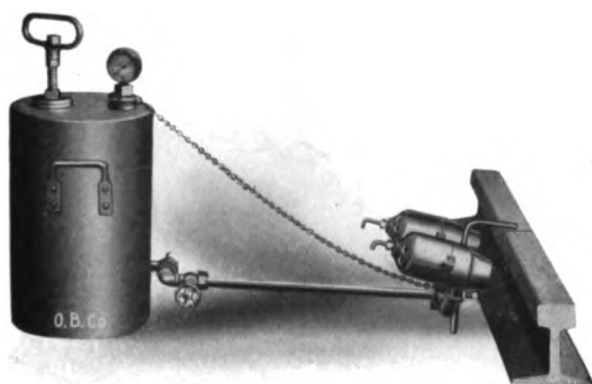
Flexible shaft is durable and easy to handle.

Counter shaft is equipped with a device for truing up emery wheel and frame is provided with a support on which the dressing tool is held.

Code Word	No.	List Each
<i>Grieve.</i>	8718—Machine, complete with Flexible Shaft (without Emery Wheel).....	\$66 00
<i>Grimace.</i>	8719—Flexible Shaft, complete for Hand Power Grinding Machine.	44 00
<i>Grimily.</i>	8210—Emery Wheel, 8-inch diameter, $\frac{3}{8}$ -inch face.....	2 00

Improved Duplex Blow Torch

Adjustable Burners



USED for rail bonding work, burners being adjustable so as to direct flame on either ball or web of rail. Will heat rail rapidly with a minimum consumption of gasoline, and when once properly started it is practically impossible for anything but an exceptionally high wind to blow out the flame.

Burners are of the coil type and are surrounded with castings which protect the flame and direct it properly onto the rail. Either burner can be controlled independently of the other.

Each burner is equipped with a small needle valve which is used to free the hole in the outlet of any sediment that may be carried into it from the gasoline.

Pump is always ready for use without opening any valve.

Capacity of tank, about 4 gallons. Weight, empty, 55 pounds.

Code Word
Grinner.

No. 9308—Blow Torch, complete.....

List Each
\$50 60

Channel Pins



THESE Channel Pins are tapered on one end so that they may be easily started in the rail, and are slightly larger than the hole in the rail so that when seated they compress tightly on the wire and make a firm and solid joint. Made of steel, copper plated.

The method of manufacturing these Pins results in turning out pins which are exactly uniform in length, taper and depth of slot, thereby making them very much superior to any other pin now on the market.

For temporary bonding, as in the case of new electric roads under construction, they afford a quick and efficient means of obtaining a good electrical circuit in temporary tracks and sidings.

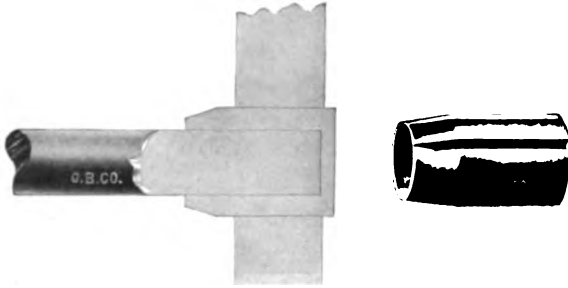
In mines using electric haulage, where it is often necessary to shift some section of track, and where it is impossible to install other bonds, the Channel Pin affords a cheap and efficient form of bonding.

Where power stations use a narrow-gauge track and small motor cars for handling coal and ashes, the Channel Pin offers a good and inexpensive method of bonding rails.

Code Word	No.	Size of Wire	Diameter of Pin	Diameter of Hole in Rail	List per 1000
<i>Grouper.</i>	1272	0	19-32 in.	9-16 in.	\$25 85
<i>Grouser.</i>	8765	0	21-32 "	5-8 "	27 50
<i>Growable.</i>	2684	2-0	19-32 "	9-16 "	25 85
<i>Grower.</i>	7546	2-0	21-32 "	5-8 "	27 50
<i>Grudge.</i>	1861	2-0	3-4 "	23-32 "	29 95
<i>Gruffly.</i>	8767	2-0	25-32 "	3-4 "	30 80
<i>Grunter.</i>	8769	4-0	3-4 "	23-32 "	29 95
<i>Guardage.</i>	4500	4-0	25-32 "	3-4 "	30 80

Steel Bonding Caps

Patented



THE Steel Bonding Cap, as the name signifies, is a metal cap which fits snugly over the end of the bonding wire and in the web or base of the rail. The metal in the Steel Caps is a soft, pliable quality of steel of high conductivity.

The method of using the Bonding Cap is as follows: the end of the bonding wire is passed through the hole in the rail, which is drilled slightly smaller than the outside diameter of the Cap; the Cap is then placed on the wire and entered in the rail. A few blows from a hammer fasten it into place. The crimp extending the full length of the Cap allows the shell to compress firmly over the wire, and into the rail, making a perfect air and moisture proof joint. In drilling the rail, care should be taken to make the hole the exact size to properly fit the Cap, and to remove the sharp edge from the entering side of the hole so as to give the Cap free entry. It is advisable, whenever possible, to drill the rail from the side from which the Cap is entered.

For cross-connecting and special bonding, the Steel Bonding Caps made in the various sizes listed, are furnished open at both ends, so as to allow the bonding wire to pass entirely through them.

Steel Bonding Caps

Patented—Continued

Code Word	No.	Size of Bonding Wire B. & S. Gauge	Diameter of Cap	Diameter of Hole in Rail	List per 1000
<i>Guardian.</i>	1850	No. 4-0	5-8 in.	19-32 in.	\$34 80
<i>Gudgeon.</i>	4490	" 2-0	21-32 "	5-8 "	35 75
<i>Guesser.</i>	1851	" 2-0	19-32 "	9-16 "	34 10
<i>Guidable.</i>	1259	" 2-0	17-32 "	1-2 "	32 45
<i>Guileful.</i>	4491	" 0	21-32 "	5-8 "	35 65
<i>Guiltily.</i>	1852	" 0	19-32 "	9-16 "	34 10
<i>Guinea.</i>	1853	" 0	17-32 "	1-2 "	32 45
<i>Guitar.</i>	1260	" 0	15-32 "	7-16 "	31 25

Caps to fit Rails already drilled furnished to order; $\frac{1}{32}$ -inch is allowed for driving fit.

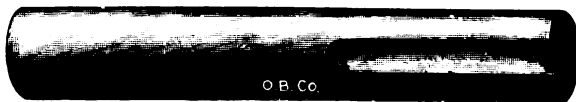
Steel Cross-Connecting Bonding Caps

Patented

Code Word	No.	Size of Bonding Wire B & S Gauge	Diameter of Cap	Diameter of Hole in Rail	List per 1000
<i>Larkspur.</i>	11374	No. 4-0	5-8 in.	19-32 in.	\$42 25
<i>Larvated.</i>	11375	" 2-0	21-32 "	5-8 "	43 25
<i>Larynx.</i>	11376	" 2-0	19-32 "	9-16 "	41 00
<i>Lascar.</i>	11377	" 0	21-32 "	5-8 "	43 15
<i>Lasket.</i>	11378	" 0	19-32 "	9-16 "	41 00

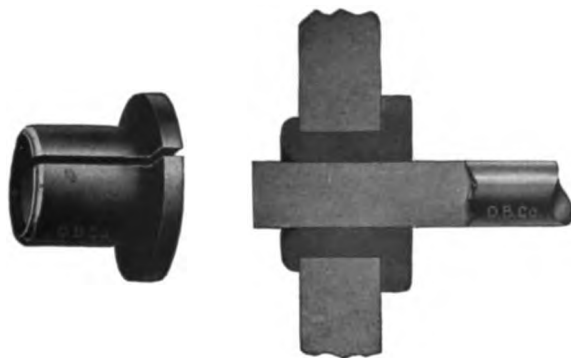
Caps to fit Rails already drilled furnished to order; $\frac{1}{32}$ -inch is allowed for driving fit.

Driving Tool for Cross-Connecting Caps



Code Word	No.		List Each
<i>Laughing.</i>	11382—	Driving Tool for 0 Bonding Wire.....	\$3 30
<i>Laughter.</i>	11383—	" " " 2-0 " "	3 30
<i>Lauder.</i>	11384—	" " " 4-0 " "	3 30

Copper Bonding Sleeves



THESE Sleeves are made of a special copper alloy of great ductility and low resistance, and when used with copper wire, make a good electrical and mechanical connection offering extremely low resistance to the current. They consist of a hollow slotted sleeve having a flange at one end, and the other so shaped that when the Sleeve is driven into place in the rail it may be upset to form a head or shoulder on the opposite side of the rail. The hole in the rail is drilled $\frac{3}{8}$ of an inch smaller than the outside diameter of the Sleeve so that when the Sleeve is driven into the rail it compresses over the wire, binding it firmly in place. In addition to regular bonding, these Sleeves are equally well adapted to cross-connecting and special bonding, as the bond wire extends entirely through the Sleeve.

To properly install these Sleeves a set of three special tools is required: i. e., Drift Punch, Driving and Upsetting Tools. The Drift Punch is intended to remove any burrs around the edge of the hole in the rail which may be left by the drill. It is driven lightly into the hole from the same side that the Bonding Sleeve is to enter. The Sleeve is then inserted in the rail and driven home by means of the Driving Tool. One end of the latter is slotted to allow it to clear the bond wire. After the Sleeve is in position the Upsetting Tool is applied to the tapered end of it to form a head or shoulder against the rail. A hole is provided in the end of this Tool to give clearance to the projecting end of the bond wire.

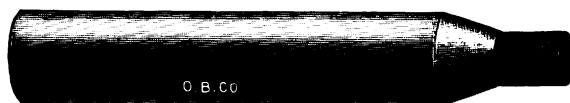
Copper Bonding Sleeves

Continued

Code Word	No.	Size of Bonding Wire B. & S. Gauge	Diameter of Sleeve	Diameter of Hole in Rail	List per 1000
<i>Gunner.</i>	3149	No. 4-0	25-32 in.	3-4 in.	\$96 80
<i>Gunster.</i>	3156	" 2-0	21-32 "	5-8 "	85 80
<i>Gurgle.</i>	4498	" 2-0	19-32 "	9-16 "	71 50
<i>Gusher.</i>	3158	" 0	21-32 "	5-8 "	85 80
<i>Gullate.</i>	3160	" 0	19-32 "	9-16 "	78 10

Sleeves to fit Rails already drilled furnished to order; $\frac{1}{32}$ -inch is allowed for driving fit.

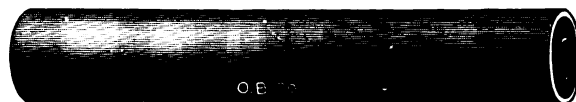
Copper Sleeve Bonding Tools



Drift Punch—Nos. 11379-11381



Driving Tool—Nos. 11382-11384



Upsetting Tool—Nos. 11385-11387

Code Word	No.	List Each
<i>Latinist.</i>	11379—Drift Punch for $\frac{3}{8}$ -inch Hole in Rail.....	\$2 75
<i>Latinity.</i>	11380— " " " " " " "	2 75
<i>Laudable.</i>	11381— " " " " " " "	2 75
<i>Laughing.</i>	11382—Driving Tool for 0 Bonding Wire.....	3 30
<i>Laughter.</i>	11383— " " " 2-0 " " "	3 30
<i>Laundry.</i>	11384— " " " 4-0 " " "	3 30
<i>Laureate.</i>	11385—Upsetting Tool for 0 Bonding Wire.....	2 75
<i>Lavaret.</i>	11386— " " " 2-0 " " "	2 75
	11387— " " " 4-0 " " "	2 75

O-B Third Rail Insulators



See following pages for description and listing.

O-B Third Rail Insulators

General Description

THE third rail system of current distribution has been used extensively for a number of years and it has been demonstrated that under certain well defined conditions, it possesses marked advantages over the overhead system.

The first forms of insulators used for supporting the third rail consisted of wood blocks attached to the cross ties, and some sort of a cap which rested on the insulating block and to which the third rail was attached. While these insulators gave satisfactory results when first installed, their efficiency as an insulating medium decreased after a time, and leakage once started, the rate of depreciation increased very fast.

Stoneware, reconstructed granite and various grades of porcelain were used later with varying degrees of success. It was found that when porcelain was vitrified sufficiently to give the necessary insulating qualities, it was too fragile to meet the service requirements mechanically.

The porcelain used in O-B Third Rail Insulators was developed particularly for this service and is a solid homogeneous body which is thoroughly vitrified and practically non-absorbent, but at the same time is very tough mechanically.

From the standpoint of insulation, mechanical strength and cost, O-B Porcelain is far superior to any other material for this service.

Owing to the wide range of service requirements, it is not possible to list in this catalogue a complete line of standard types of O-B Third Rail Insulators, but a few of the more popular types are illustrated and described on the following pages, and it is suggested that those interested take advantage of our experience and knowledge in this line and when in the market ask for our recommendations on the exact type best suited to meet their requirements.

In making inquiry the following information should be given: The type of insulator desired, the section number, weight and name of manufacturer of conductor rail, or at least the weight and width of base, and the vertical height of the insulator, *i. e.*, the distance from top of cross tie to base of conductor rail.

O-B Third Rail Insulators

Type A



USED largely by industrial properties, and is suitable for rails up to 50 lbs. per yard. Can be furnished in heights from $4\frac{1}{2}$ to $7\frac{1}{4}$ inches.

Consists of a porcelain block and malleable fittings, of which both the base and cap are cemented to the insulator.

Type B



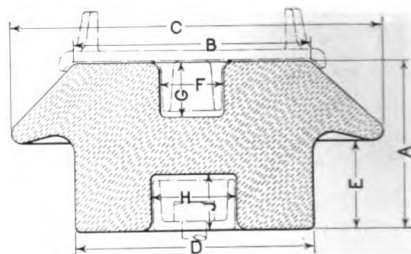
USED largely by industrial properties and is suitable for rails from 50 to 90 pounds where the rail must be kept relatively close to the supporting tie. Height, $3\frac{5}{8}$ inches.

Consists of a substantial semi-porcelain block, a malleable cap loosely mounted on insulator and two clamp castings by which insulator is securely fastened to tie.

See page 492 for general description.

O-B Third Rail Insulator

Type C



PORCELAIN block rests directly on tie over a cup casting which is lagged to tie.

Rail rests on a malleable cap casting provided with vertical lugs for holding rail in proper alignment, and circular lug at center projecting downward to hold cap in position on block.

A canvas or felt pad should be used between cap casting and porcelain block.

Projecting skirt affords protected leakage surface which increases electrical efficiency.

This type is used by the Philadelphia & Western Railway Co. and the Long Island R. R. Co.

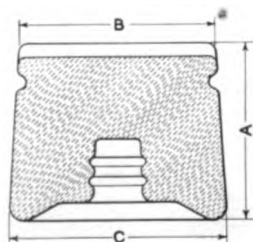
Dimensions in Inches

Size No.	A	B	C	D	E	F	G	H	J
1	4 $\frac{1}{4}$	6	9 $\frac{1}{4}$	6	2 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{7}{8}$
2	4 $\frac{7}{8}$	6	9 $\frac{1}{4}$	6	2 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{7}{8}$
3	5	5 $\frac{3}{4}$	8	5	3 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	2 $\frac{1}{8}$	1 $\frac{1}{2}$

See page 492 for general description.

O-B Third Rail Insulator

Type D



USED by both railway and industrial properties.

Consists of a square porcelain block, malleable base, two malleable lug castings and a machine bolt. Insulating block is cemented on base, and lug castings are held in place, engaging both rail and block, by machine bolt.

Among those using this type are the Interboro Rapid Transit Co., on both subway and elevated; The Scioto Valley Traction Co. and the American Agricultural Chemical Co.

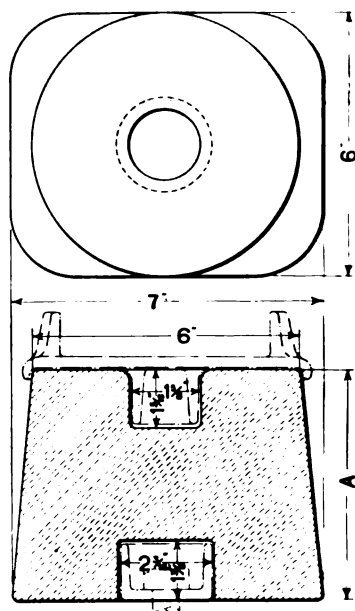
Dimensions in Inches

Size No.	A	B	C
1	3	3	4
2	3½	5½	6
3	3¾	4¾	5½
4	4⅞	5¾	6
5	4¾	5¾	6

See page 492 for general description.

O-B Third Rail Insulator

Type E



PORCELAIN block rests directly on tie over a malleable cup casting, which is lagged to tie. The malleable cap casting is provided with vertical lugs to prevent lateral movement of rail and a circular lug at the center, projecting downward to hold cap in position on block.

A canvas or felt pad should be used between cap casting and porcelain block.

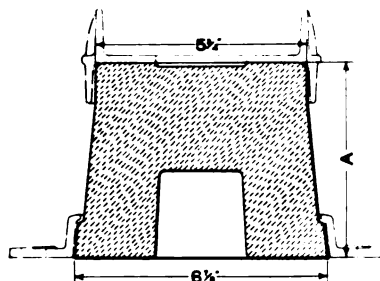
Among those using this type are the Pennsylvania Tunnel & Terminal Co., The Long Island R. R. Co. and the Philadelphia & Western Ry. Co.

Dimension	Size No. 1	Size No. 2	Size No. 3	Size No. 4
A	4 $\frac{7}{16}$ "	4 $\frac{11}{16}$ "	5 $\frac{1}{4}$ "	5 $\frac{1}{4}$ "

See page 492 for general description.

O-B Third Rail Insulator

Type F



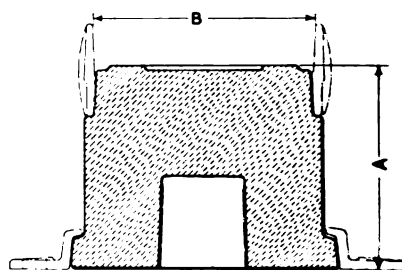
CONSISTS of a porcelain block, which rests directly on tie and which may be held in place by a malleable clamping ring, as shown above, extending entirely around the block and with projecting lugs by which it is lagged to the tie, or the block may rest over a malleable cup casting as shown for the Type C Insulator on page 494. Cap casting is provided with vertical lugs for holding rail in proper alignment and should rest on a canvas or felt pad.

Among those using this type is the Aurora, Elgin & Chicago Railway Company.

Dimension	Size No. 1	Size No. 2
A	5 $\frac{1}{16}$ "	6 $\frac{1}{16}$ "

O-B Third Rail Insulator

Type G



CONSISTS of a porcelain block which rests directly on tie and which may be held in place by two clamp castings as shown above, or the block may rest over a cup casting as shown for the Type C Insulator on page 494.

Malleable ring casting is provided with vertical lugs to hold rail in proper alignment.

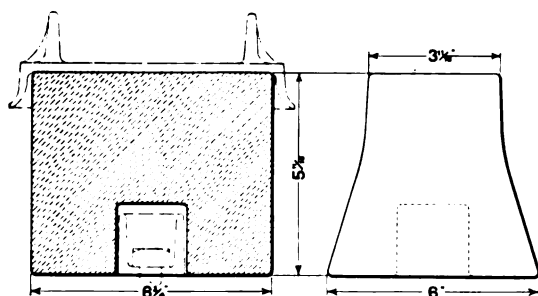
Dimensions in Inches

Size No.	A	B
1	5½	5½
2	5½	5½
3	6½	4½

See page 492 for general description.

O-B Third Rail Insulator

Type H



PORCELAIN block rests directly on tie over a malleable cup casting which is lagged to the tie. Cup casting is square in section, as is also the hole in bottom of block.

The malleable cap casting is provided with vertical lugs to prevent lateral movement of rail.

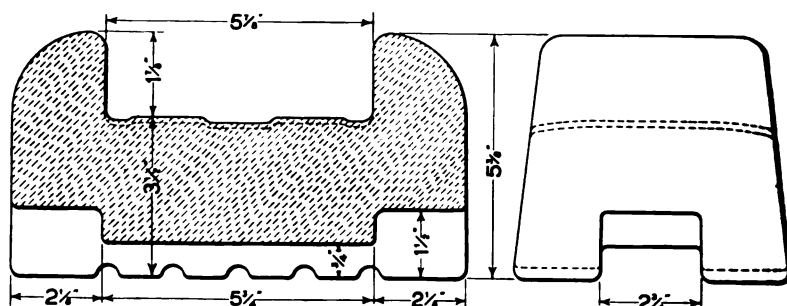
A canvas or felt pad should be used between cap casting and porcelain block.

This Insulator is used by the Michigan United Traction Company.

See page 492 for general description.

O-B Third Rail Insulator

Type K



PORCELAIN block rests directly on tie and is held in position by a bar iron forging which fits in the slot running across bottom of insulator.

Slot is recessed at each end to provide clearance for the heads of lag screws which fasten forging to tie.

Block is provided with porcelain lugs to hold rail in proper alignment.

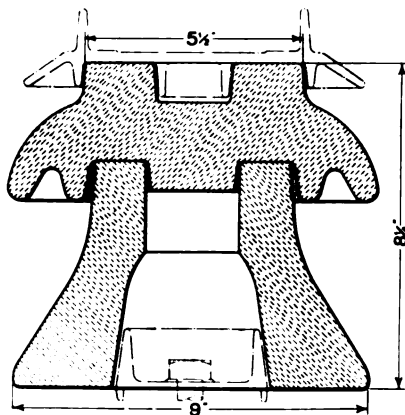
The forging may be extended to provide a support for third rail protection board, if desired.

Used by West Jersey and Seashore Railroad Company.

See page 492 for general description.

O-B Third Rail Insulator

Type M



PORCELAIN block is made up of two pieces, cemented together, and rests directly on the tie over a malleable cup casting which is lagged to the tie.

Cup casting is rectangular in section as is also the hole in bottom of block.

Four short lugs extend downward from bottom of cup casting which serve to prevent it from turning on tie.

Rail rests on a malleable cap casting provided with vertical lugs for holding rail in proper alignment and circular lug at center projecting downward to hold cap in position on block.

A canvas or felt pad should be used between cap casting and porcelain block.

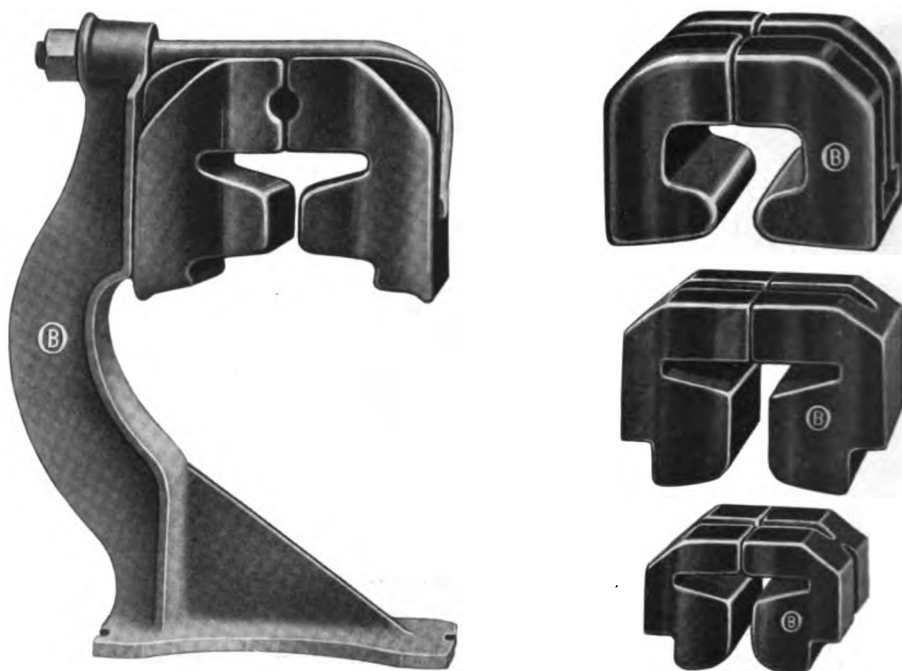
This Insulator has considerable protected leakage surface and is designed for 2,400 volt D. C. operation.

It is used by the Michigan Railway Engineering Company.

See page 492 for general description.

O-B Third Rail Insulators

Type N



DESIGNED to suspend a bullhead or an inverted tee rail for an under-running contact system. Consists of a pair of semi-porcelain blocks, a malleable support casting and a strap, or bolt. The manner in which they are assembled is shown in the illustration.

Can be furnished in a number of sizes; full data given on request.

Prominent among the users of this type are the following: Central California Traction Co., New York Central & Hudson River R. R., Detroit River Tunnel Co., Philadelphia Rapid Transit Co., and many industrial plants.

See page 492 for general description.

O-B Cable Terminal Insulators

Type A—Forms 1 and 2



Type A—Form 1



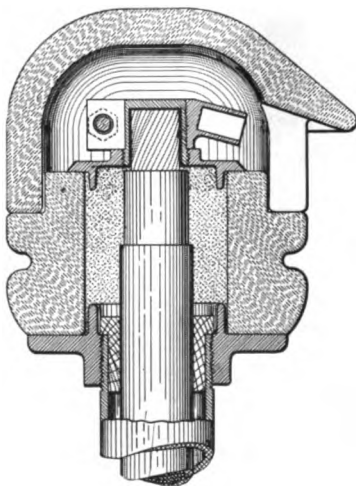
Type A—Form 2

See description and listing on following page.

O-B Cable Terminal Insulators

Type A—Forms 1 and 2

Continued



USED on third rail systems to insulate the cable terminal where it leaves the underground conduit and provides means for making flexible connection with contact rail. Insulator base and cap are made of porcelain.

Terminal casting is provided with lugs to receive stub ends of bonds used for making connection with contact rails.

Space between insulator support flange and cable support flange which rests on top of porcelain base should be filled with insulating compound.

Form 1

Code Word	No.		List Each
<i>Ophelic.</i>	12363—	Form 1 Insulator, complete, for 1,000,000 C. M. Cable. . .	\$10 00
<i>Lavender.</i>	11311—	" 1 Porcelain Cap and Base only, for 1,000,000 C. M. Cable. . .	3 50
<i>Ophiuran.</i>	12364—	" 1 Metal Fittings only, for 1,000,000 C. M. Cable. . .	6 50
<i>Opiate.</i>	12365—	" 1 Insulator, complete, for 2,000,000 C. M. Cable. . .	12 50
<i>Laverock.</i>	11312—	" 1 Porcelain Cap and Base only, for 2,000,000 C. M. Cable. . .	3 95
<i>Outpace.</i>	12366—	" 1 Metal Fittings only, for 2,000,000 C. M. Cable. . .	8 55

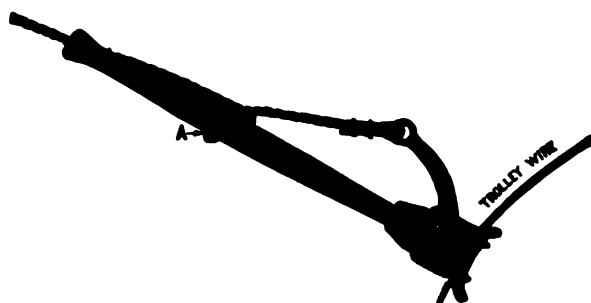
Form 2

<i>Opiface.</i>	12367—	Form 2 Insulator, complete, for 1,000,000 C. M. Cable. . .	10 40
<i>Lavisher.</i>	11313—	" 2 Porcelain Cap and Base only, for 1,000,000 C. M. Cable. . .	3 85
<i>Opinator.</i>	12368—	" 2 Metal Fittings only, for 1,000,000 C. M. Cable. . .	6 50

See illustrations on preceding page.

O-B Trolley Wire Pick-Up

Patent Applied For



Showing Pick-Up in Use

INTENDED for picking up the broken end of live trolley wire and for pulling it up out of the way and suspending it.

Made of a 14-inch impregnated and varnished wood stick, similar to that used in our Wood Strain Insulators, on one end of which is swaged a malleable iron casting having a lip into which the wire fits, formed at right angles to the stick. A cam with a lever attached is fastened on to this end casting in such a way as to engage the wire when a pull is exerted on the rope fastened to the end of the lever. A hole is drilled at an acute angle to the axis of the stick at (A) and the rope passed through it so as to form a permanent half-hitch around the stick.

This Pick-Up is applied at right angles to the wire, thus minimizing the danger of the operator coming in contact with the live wire when using it.

The device is positive in its action, since the cam grips the wire firmly, owing to the half-hitch of the rope around the stick and will not let go even though the strain on the rope is accidentally released.

The ends of the lip in which the wire rests have been rounded off so that there is no danger of kinking the wire at this point. It will grip all sizes of trolley wire tightly, from a badly worn 1-0 size up.

All metal parts are sherardized.

Code Word
Imagery.

No. 10633—Pick-Up, complete with 50 ft. of $\frac{3}{4}$ -inch Manila Rope.....\$2 20

List Each

O-B Mine Trolley Wheel



THIS Wheel is especially designed for use on mine locomotives, and is well proportioned with a heavy section of metal at the bottom of the groove where the wear is heaviest and has heavy flanges which resist bending.

It is made of a special high grade alloy that will give maximum service.

Wheel is furnished with a self-lubricating, Bound Brook Type Bushing, which is made of a special bearing metal with graphite inserted in grooves on the inside by a patented process, and in addition, is provided with an oil reservoir, thus insuring perfect lubrication.

Bushing is $\frac{3}{4}$ inch outside diameter, $\frac{1}{2}$ -inch bore and $1\frac{1}{2}$ inches long.

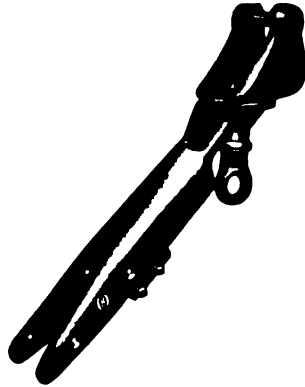
The O-B Wheel is used with the Mine Harp listed on page 507 but can be used with any standard mine harp. Width of flange is $1\frac{1}{2}$ inches, hub $1\frac{1}{2}$ inches, bore $\frac{1}{2}$ inch.

Code Word	No.	List Each
<i>Intervital.</i>	11017—4-inch Wheel for $\frac{1}{2}$ -inch Axle.....	\$2 20
<i>Huronian.</i>	10819—Graphite Bushing, $\frac{3}{4}$ x $1\frac{1}{2}$ x $\frac{1}{2}$ inches.....	25

The above Wheel is designated by its nominal diameter; the actual diameter is $4\frac{1}{2}$ inches.

O-B Mine Trolley Harp

Patent Applied For



USED with mine locomotives and possesses several features very desirable in that service.

Harp casting is connected to pole end casting by a pivot, thus permitting free rotation of harp. Pivot is set forward of wheel axle so that a trailing action is imparted to the Harp, causing it to readily follow irregularities in trolley wire.

Harp may also be rotated manually by a strap or stick fastened to the eye on the lower end of pivot. This permits locomotive driver to guide Harp easily at all times.

Rib on pole end casting prevents Harp from catching on overhead I-beams or roof timbers.

Can be used with any standard 4-inch wheel having a $\frac{1}{2}$ x $1\frac{1}{2}$ -inch bushing.

Feeder lug will take 4-0 stranded or smaller wires and in addition is provided with a separable brass terminal which may be soldered to a 4-0 stranded cable.

Harp complete, as listed below, includes contact springs and washers, axle and cotter pins while Harp castings only include simply the contact springs.

Weights packed, each, are: No. 11161, 4 pounds; No. 11162, $4\frac{1}{2}$ pounds.

Code Word	No.	List Each
<i>Lawful.</i>	11161—Harp, complete, Malleable Iron, Japanned.....	\$4 95
<i>Lawless.</i>	11162—“ “ “ Bronze, with Malleable Iron Pole Casting..	7 15
<i>Lawmaker.</i>	11163—Harp Casting only, Malleable Iron, Japanned.....	1 90
<i>Leafcup.</i>	11164—“ “ “ Bronze.....	4 65
<i>Leafless.</i>	11165—Phosphor Bronze Contact Spring.....	15
<i>Leamer.</i>	11166—Copper Contact Washer.....	05
<i>Leanness.</i>	11167—Axle, $\frac{1}{4}$ -inch Diam., Case Hardened, with Cotter Pins.....	25
<i>Leaping.</i>	11168—Pole Casting, Malleable Iron, Japanned.....	2 20

O-B Trolley Base

Patented

Form 1

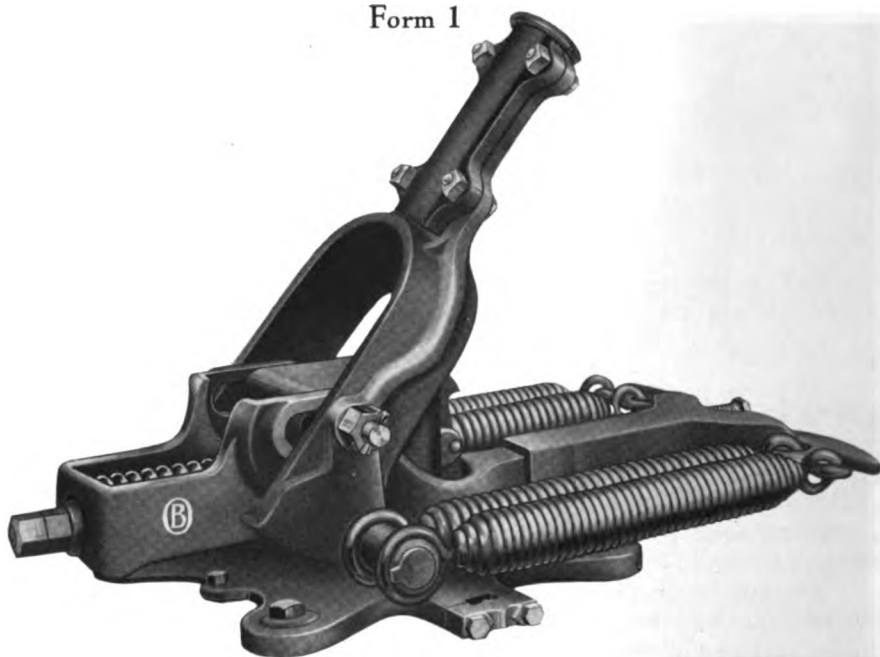


Fig. 1—Form 1 Base

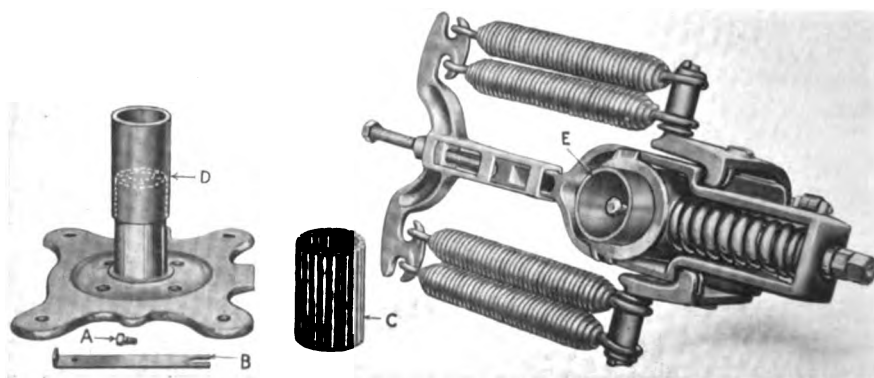


Fig. 2—Showing renewable bushing feature at "D" and "E"

See following page for description and listing.

O-B Trolley Base

Patented

Form 1—Continued

POSSESSES several original features and utilizes the tension spring feature, which is now recognized as the most approved form of construction.

Light in weight, easily assembled and gives uniform tension on trolley.

Roller bearings are set in an improved type of cage which keeps rollers upright and prevents jamming.

Bearings are easy of access at all times.

Stem and turret are provided with steel bearing bushings which may be renewed when worn and thus greatly increase life of Base.

Sliding yoke construction relieves the bearing of unbalanced strains and a buffer spring prevents bending of trolley poles.

Hook is provided for holding fork down for pole renewal in car barn.

Tension springs are closed at the ends over drop forgings, thus minimizing spring breakage, and are provided with special bearing sleeves which prevent excessive wear between spring eye and fork.

No. 11398, as listed below, is equipped with two low and two medium tension springs; No. 11399 is equipped with four medium tension springs, and No. 11934 is equipped with two medium and two high tension springs.

Always specify tension of trolley pole desired and length of pole used. Socket will accommodate poles $1\frac{1}{2}$ to $1\frac{3}{8}$ inch inclusive outside diameter at butt.

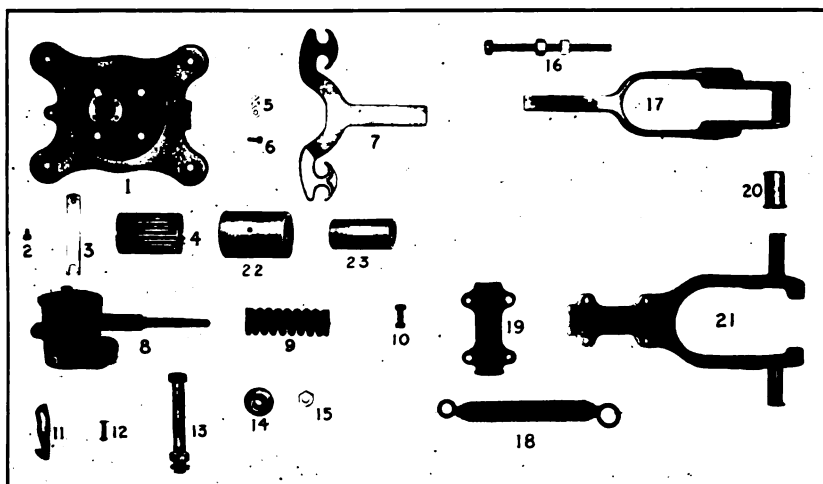
Height overall, with trolley pole horizontal, $6\frac{1}{2}$ inches. Castings are malleable iron. All parts are painted and threaded parts are sherardized. Net weight, 110 pounds.

Code Word	No.	List Each
<i>Limbate.</i>	11398—Form 1 Low Spring Tension Base	\$41 80
<i>Limbous.</i>	11399— “ 1 Medium “ “ “	41 80
<i>Opinicus.</i>	11934— “ 1 High “ “ “	41 80

Always specify tension of trolley pole desired and length of pole used.

O-B Trolley Base Parts

For Form 1 Base



The listing below refers to a single part in each case, and if more than one part of the same kind is wanted, state quantity desired.

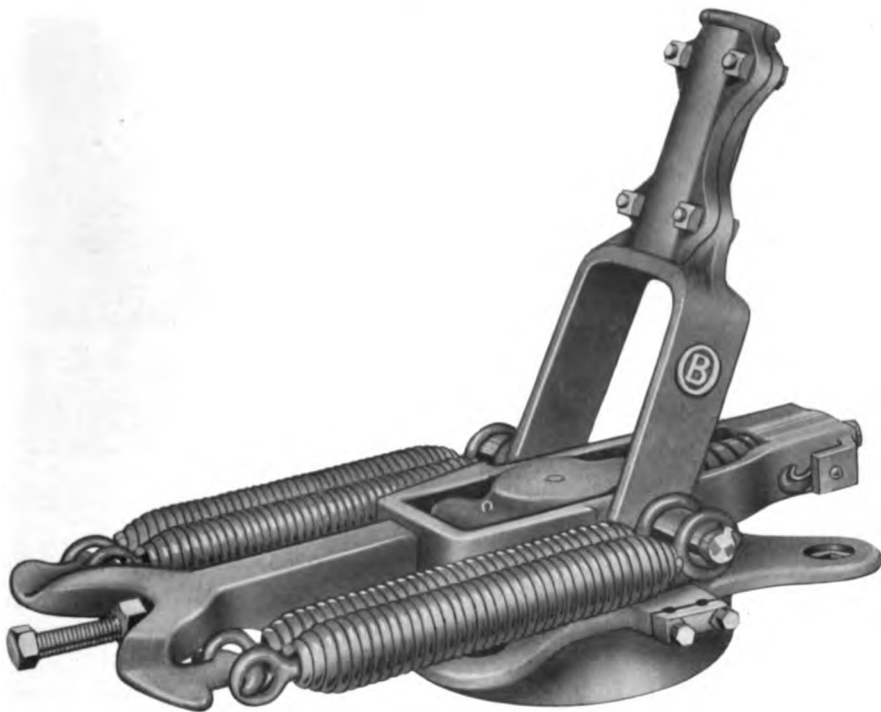
Code Word	No.	Part No.	List Each
<i>Legioned.</i>	11400	1 Stem Casting with Bushing.....	\$6 60
<i>Leisure.</i>	11401	2 Retaining Fork Screw.....	05
<i>Lemming.</i>	11402	3 Retaining Fork.....	35
<i>Lendable.</i>	11403	4 Roller Bearing, complete.....	2 20
<i>Leniency.</i>	11404	5 Cable Clamp.....	25
<i>Lenitude.</i>	11405	6 " " Cap Screw.....	10
<i>Lenticel.</i>	11406	7 Spring Adjusting Casting.....	1 45
<i>Lentil.</i>	11407	8 Turret, complete.....	7 70
<i>Lentous.</i>	11408	9 Buffer Spring.....	70
<i>Leonese.</i>	11409	10 Trolley Pole Clamp Bolt with Nut.....	10
<i>Leopard.</i>	11410	11 Hold Down Hook.....	25
<i>Lepidoid.</i>	11411	12 " " Pin with Cotter.....	10
<i>Leperize.</i>	11412	13 Main Fork Pin with Nut and Cotter.....	35
<i>Leporine.</i>	11413	14 Buffer Spring Washer.....	25
<i>Leprosy.</i>	11414	15 " " Post Nut.....	10
<i>Lelhargy.</i>	11415	16 Tension Bolt with Nuts.....	25
<i>Lettuce.</i>	11416	17 Yoke.....	3 85
<i>Levant.</i>	11418	18 No. 9 Low Tension Spring (see Note below).....	1 55
<i>Leucite.</i>	11417	" 10 Medium " " " " " ".....	1 65
<i>Oppilate.</i>	11935	" 11 High " " " " " ".....	1 80
<i>Levator.</i>	11419	19 Trolley Pole Clamp.....	70
<i>Levesel.</i>	11420	20 Spring Bearing Sleeve.....	15
<i>Levitate.</i>	11421	21 Fork.....	5 30
<i>Mobbish.</i>	11444	22 Turret Bearing Bushing.....	1 35
<i>Mobile.</i>	11445	23 Stem " ".....	90

NOTE—Base No. 11398 is equipped with two No. 9 and two No. 10 springs; Base No. 11399 is equipped with four No. 10 springs and Base No. 11934 is equipped with two No. 10 and two No. 11 springs.

O-B Trolley Base

Patented

Form 2—Low Base



FOR use where minimum overall height is desired. Possesses all the desirable features of the Form 1 Base described on page 509.

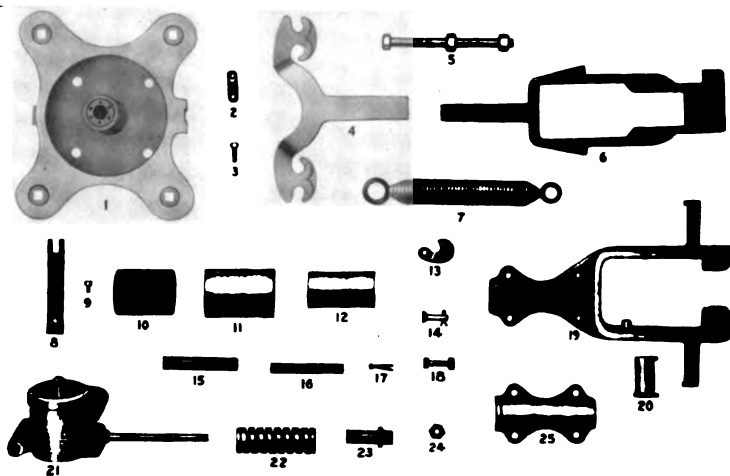
No. 12369 is equipped with two low and two medium tension springs; No. 12370 with four medium tension springs, and No. 12371 with two medium and two high tension springs.

Height, overall, above running board is $3\frac{3}{4}$ inches. Outside diameter of dished portion is $9\frac{1}{4}$ inches; extends $2\frac{1}{8}$ inches below running board. Castings malleable iron; all parts painted and threaded parts are sherardized.

Code Word	No.	List Each
<i>Opponent.</i>	12369—Form 2 Low Spring Tension Base.....	\$41 80
<i>Oppress.</i>	12370— “ 2 Medium “ “ “	41 80
<i>Oppugner.</i>	12371— “ 2 High “ “ “	41 80

O-B Trolley Base Parts

For Form 2—Low Base



Code Word	No.	Part No.	
<i>Optical.</i>	12372	1	Stem with Bushing.....
<i>Leniency.</i>	11404	2	Cable Clamp.....
<i>Lenitude.</i>	11405	3	" " Cap Screw.....
<i>Lenticel.</i>	11406	4	Spring Adjusting Casting.....
<i>Lethargy.</i>	11415	5	Tension Bolt with Nuts.....
<i>Optician.</i>	12373	6	Yoke.....
<i>Levant.</i>	11418	7	No. 9 Low Tension Spring (See Note below).....
<i>Leucite.</i>	11417	7	" 10 Medium " " " " ".....
<i>Oppilate.</i>	11935	7	" 11 High " " " " ".....
<i>Lemming.</i>	11402	8	Retaining Fork.....
<i>Leisure.</i>	11401	9	" " Screw.....
<i>Optimate.</i>	12374	10	Roller Bearing, complete.....
<i>Optimism.</i>	12375	11	Turret Bearing Bushing.....
<i>Oquassa.</i>	12376	12	Stem.....
<i>Oracle.</i>	12377	13	Hold Down Hook.....
<i>Orangery.</i>	12378	14	" " " Pin with Cotter.....
<i>Orangle.</i>	12379	15	Main Fork Pin.....
<i>Orestress.</i>	12380	16	Yoke Pin.....
<i>Orbate.</i>	12381	17	Retaining Cotter (used with Nos. 15 and 16).....
<i>Leonesc.</i>	11409	18	Trolley Pole Clamp Bolt with Nut.....
<i>Orbical.</i>	12382	19	Fork.....
<i>Levesel.</i>	11420	20	Spring Bearing Sleeve.....
<i>Orbity.</i>	12383	21	Turret, complete.....
<i>Orcein.</i>	12384	22	Buffer Spring.....
<i>Orchard.</i>	12385	23	" " Sleeve.....
<i>Orchid.</i>	12386	24	" " Post Nut.....
<i>Levator.</i>	11419	25	Trolley Pole Clamp.....

NOTE—Base No. 12369 is equipped with two No. 9 and two No. 10 springs; Base No. 12370 is equipped with four No. 10 springs; Base No. 12371 is equipped with two No. 10 and two No. 11 springs.

O-B Trolley Catcher

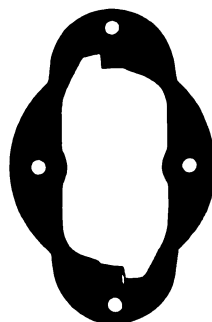
Patent Applied For



Nos. 11627-11628



Phantom View



No. 11628

USED to catch trolley pole when wheel jumps and prevent damage which would result if pole caught in overhead.

Operation is quick and positive. Three dogs fastened to back of reel are thrown outward when trolley jumps. One dog slides over guide (A-B) and engages stop at (B) preventing further flight of pole. Dog will not release accidentally because guide (A-B) prevents it being pulled in by spring until rope is reeled in farther than it will be on the rebound; hence, there is no "stepping up" of pole.

All parts are ruggedly constructed. Springs attached to dogs are worked through a short distance only and, therefore, will give long service. They are enameled to prevent rusting.

Main operating spring is well protected in back of case.

Catcher is attached to bracket by a snap latch. A bracket can be mounted on each end of car and one catcher used for double end operation.

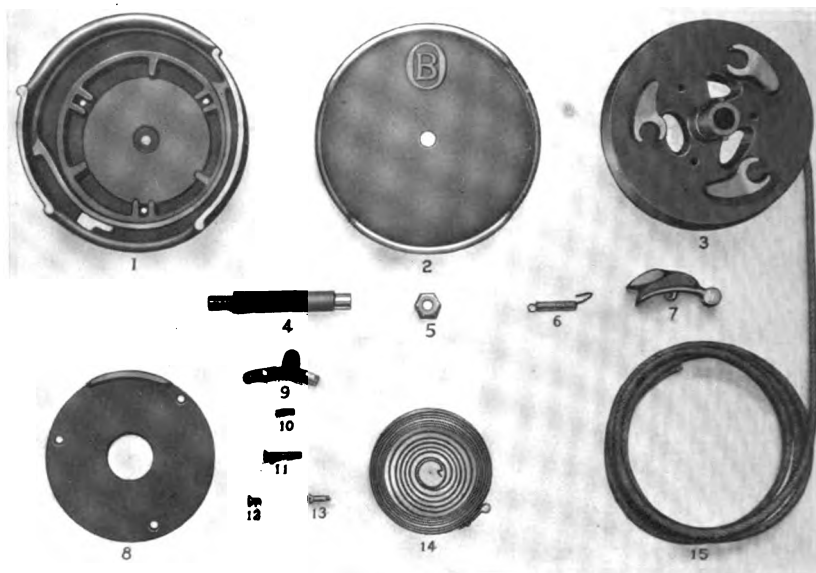
Holes in bracket are $\frac{3}{8}$ inch in diameter; vertical spacing 8 inches, horizontal spacing $4\frac{1}{2}$ inches.

Weight, without bracket, $15\frac{1}{2}$ pounds. Case is malleable iron, enameled.

Catcher is furnished with 22 feet of $\frac{1}{4}$ -inch trolley rope.

Code Word	No.	List Each
<i>Ordain.</i>	11627—Trolley Catcher, with rope, without Bracket.....	\$8 80
<i>Ordainer.</i>	11628—Bracket only, Malleable Iron, Enameled.....	55

O-B Trolley Catcher Parts



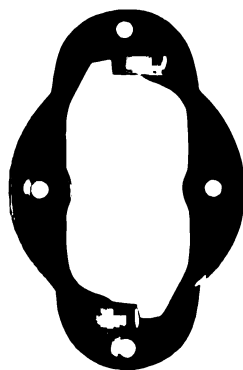
Code Word	No.	Part No.	
<i>Ordeal.</i>	12387	1	Case.....
<i>Ordinal.</i>	12388	2	Cover.....
<i>Ordinant.</i>	12389	3	Reel.....
<i>Ordinate.</i>	12390	4	Center Stud.....
<i>Ordinance.</i>	12391	5	Grip Nut.....
<i>Orectic.</i>	12392	6	Throw-Out Dog Spring.....
<i>Oreodont.</i>	12393	7	Throw-Out Dog.....
<i>Organdy.</i>	12394	8	Partition Plate.....
<i>Organic.</i>	12395	9	Case Latch.....
<i>Organist.</i>	12396	10	Case Latch Spring.....
<i>Orgeat.</i>	12397	11	Partition Plate Screw.....
<i>Orgies.</i>	12398	12	Center Stud Oil Screw.....
<i>Oriency.</i>	12399	13	Case Latch Screw.....
<i>Orient.</i>	12400	14	Main Spring.....
<i>Oriental.</i>	12401	15	Trolley Rope, $\frac{1}{4}$ -inch Diam., 22 feet long.....

O-B Trolley Retriever

Patented



Nos. 11973-11628



No. 11628

USED to catch trolley pole when wheel jumps and automatically pull it down so as to clear the overhead construction. Upward travel of pole is reduced to a minimum and a powerful retrieving action instantly follows.

After the retrieving operation, resetting of the mechanism is quickly accomplished by simply pulling out the rope until a positive stop is reached. Rope should then be slackened a trifle which action unlocks the reel from the rewound retrieving spring, the Retriever being again in operating condition.

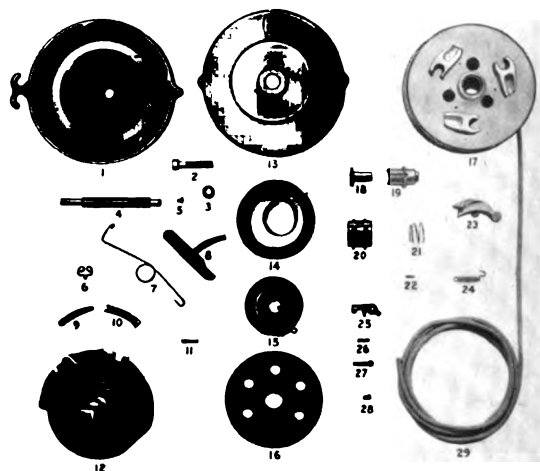
In designing this device we have kept in mind the necessity of ruggedness and simplicity of all parts, ability to withstand varied weather conditions, and the further necessity of making it practically impossible to either accidentally or willfully render the device inoperative.

Retriever is attached to bracket by a snap latch. A bracket can be mounted on each end of car and one Retriever used for double end operation.

Holes in bracket are $\frac{3}{8}$ inch in diameter; vertical spacing is 8 inches; horizontal spacing, $4\frac{1}{2}$ inches. Case is malleable iron, enameled. Retriever is furnished with 22 feet of $\frac{5}{16}$ -inch trolley rope.

Code Word	No.	List Each
Orifice.	11973—Trolley Retriever, with Rope, without Bracket.....	\$28 60
Ordainer.	11628—Bracket only, Malleable Iron, Enameled.....	55

O-B Trolley Retriever Parts



Code Word	No.	Part No.	
<i>Orillon.</i>	12402	1	Case.....
<i>Oriole.</i>	12403	2	Case Cap Screw.....
<i>Oriskany.</i>	12404	3	" " Lock Washer.....
<i>Orisont.</i>	12405	4	Center Stud.....
<i>Orgies.</i>	12398	5	" " Oil Screw.....
<i>Orleans.</i>	12406	6	Latch Dog Spring with Screw.....
<i>Ornament.</i>	12407	7	Floating Lever Spring.....
<i>Ornate.</i>	12408	8	Floating Lever.....
<i>Oroide.</i>	12409	9	Winding Stop Dog.....
<i>Orotund.</i>	12410	10	Main Latch Dog.....
<i>Orphan.</i>	12411	11	Dog Pin (Used with Nos. 9 and 10).....
<i>Orphean.</i>	12412	12	Retrieving Disc.....
<i>Orphrey.</i>	12413	13	Cover.....
<i>Orpine.</i>	12414	14	Retrieving Spring.....
<i>Orient.</i>	12400	15	Service Spring.....
<i>Orthid.</i>	12415	16	Partition Plate.....
<i>Orthodox.</i>	12416	17	Reel.....
<i>Orthoepy.</i>	12417	18	Winding Ratchet, Male Half.....
<i>Orthogon.</i>	12418	19	" " Female Half.....
<i>Ortolan.</i>	12419	20	Retrieving Spring Core.....
<i>Osages.</i>	12420	21	Winding Ratchet Spring.....
<i>Oscinian.</i>	12421	22	" " Pin.....
<i>Oreodont.</i>	12393	23	Throw-Out Dog.....
<i>Orectic.</i>	12392	24	" " " Spring.....
<i>Oscitant.</i>	12422	25	Case Latch.....
<i>Oscule.</i>	12423	26	" " Spring.....
<i>Osmius.</i>	12424	27	" " Cotter Pin.....
<i>Osmose.</i>	12425	28	Partition Plate Screw.....
<i>Osmund.</i>	12426	29	Trolley Rope, $\frac{1}{4}$ -inch diameter, 22 feet long.....

O-B Chime Whistle



THE O-B Chime Whistle is designed for operation by compressed air on Interurban Electric Roads.

It is made of bronze throughout and is neat in appearance and very compact. The parts are few in number and minimize chance to get out of order.

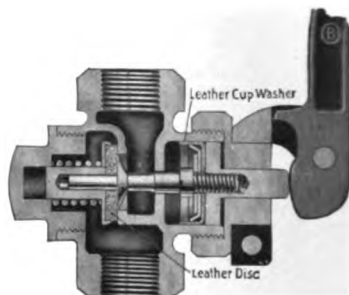
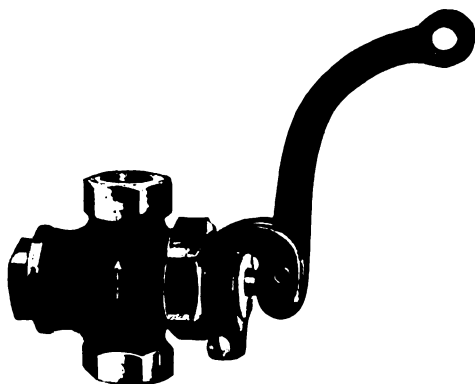
The blast is a deep toned warning that can be heard for a great distance and the Whistle requires only a small amount of air.

The lower end is tapped with $\frac{1}{4}$ -inch standard iron pipe thread

The bell of Whistle No. 10642 is 2 inches in diameter and 4 inches in length, while that of Whistle No. 10759 is 2 inches in diameter and 10 inches in length.

Code Word	No.	List Each
<i>Hummer.</i>	10642—Chime Whistle, length of Bell 4 Inches.....	\$3 30
<i>Hunch.</i>	10759— " " " " 10 "	5 50

O-B Whistle Valve



THE valve stem is fitted with a leather disc similar to that used in the O-B Air Sander Valve but the opening around the stem is equal in area to a $\frac{1}{2}$ -inch pipe and permits a volume of air to pass that is sufficient to operate the largest size of air whistle.

Leakage of air around the operating plunger is effectually prevented by means of a cup-shaped leather washer in the top of the Valve which expands against the inner wall of the body under the air pressure when the Valve is being operated. The cup washer is subject to air pressure only when the Valve is open.

The handle can be rotated with respect to the body so that the Valve can be located in any desired position provided the flow of air is in the direction indicated by the arrow on the body.

The Valve is made of high grade bronze and the handle is malleable iron, sherardized.

Both inlet and outlet are tapped for $\frac{1}{2}$ -inch iron pipe.

Code Word
Hurden.

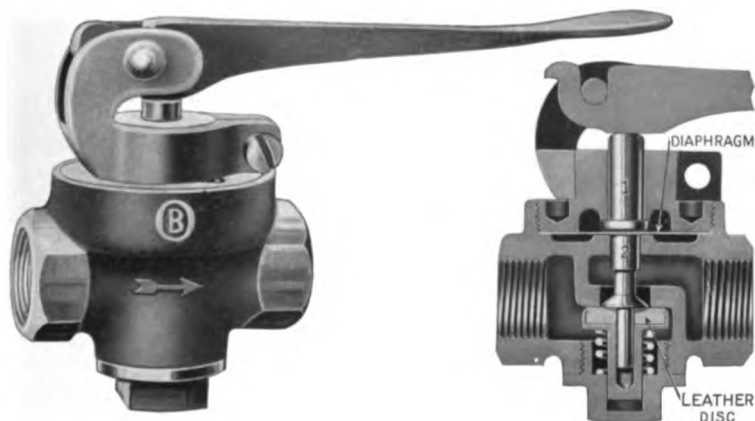
No. 10861—Whistle Valve, with handle \$4 00

List Each

O-B Air Sander Valve

Patented

Diaphragm Type—Form 1



POSSESSES an exclusive feature in the flexible bronze diaphragm between the valve stem (2) and the plunger (1) which opens the Valve, making it absolutely impossible for air to leak around the plunger stem (1) when it is being operated and avoiding the necessity of packing and therefore making the Valve easier to operate.

Leather disc makes it impossible for small particles of dirt to cause leakage and eliminates regrinding.

Clevis to which the handle is attached can be rotated with respect to the valve body so that it is possible to install the Valve at either side of the engineer's valve and turn the operating handle immediately over the engineer's valve handle.

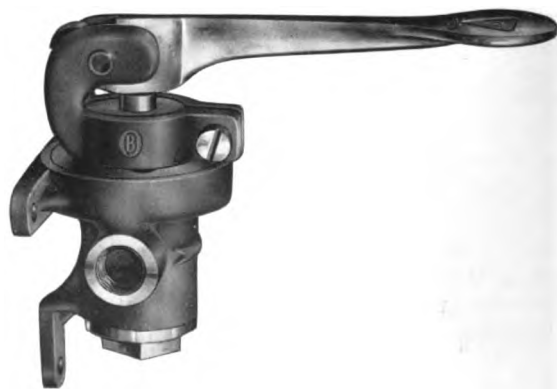
Made from high grade bronze and neatly finished; is absolutely leakless and can be depended upon to give satisfactory service. Inlet and outlet openings are tapped for $\frac{1}{2}$ -inch iron pipe.

Code Word	No.	List Each
<i>Flutter.</i>	10568—O-B Air Sander Valve, without handle.....	\$3 30
<i>Ossific.</i>	11438—Operating Handle only.....	45

O-B Air Sander Valve

Patented

Diaphragm Type—Form 2—Bracket Mounting



POSSESSES the same popular diaphragm feature and other internal construction of the Form 1 Valve listed on preceding page.

A bracket, cast integrally with the body, offers means of fastening valve to car panels or a block or bracket, if such is necessary to locate the handle over engineer's valve.

Horizontal distance between centers of top screw holes is $2\frac{1}{2}$ inches; vertical distance between bottom hole and center line of top hole is $2\frac{3}{32}$ inches. Holes are $\frac{7}{32}$ inch in diameter.

Inlet and outlet openings are tapped for $\frac{1}{4}$ -inch iron pipe. This is smaller than that used with the Form 1 Valve where a heavier pipe is necessary in order to support the valve.

Operating Handle listed below is $4\frac{1}{2}$ inches long overall and may be used with either the Form 1 or Form 2 Valve.

Code Word	No.	List Each
<i>Osseler.</i>	11437—Sander Valve, Bracket Mounting, without Handle.....	\$3 30
<i>Ossific.</i>	11438—Operating Handle only.....	45

Independent Air Sander Valve



USED in connection with the O-B Air Sand Trap when it is not desired to have Sander Valve located immediately over Brake Valve.

Tapered valve seat as shown in sectional view permits flow of air to be regulated as desired and insures a tight seat when closed. Handle is removable for double end operation.

Locking plate has a projecting lug which acts as a stop for valve handle and may be adjusted to any desired point.

Locking plate also makes it impossible to remove handle except when valve is closed.

Valve should be connected up so that flow of air will be in direction indicated by arrow on valve body.

Code Word	No.	List Each
<i>Fabulist.</i>	8280—Independent Sander Valve, without Handle, for $\frac{1}{4}$ -inch Iron Pipe	\$2 75
<i>Facile.</i>	8281—Operating Handle for Independent Valve	55

Wire Sander Hose

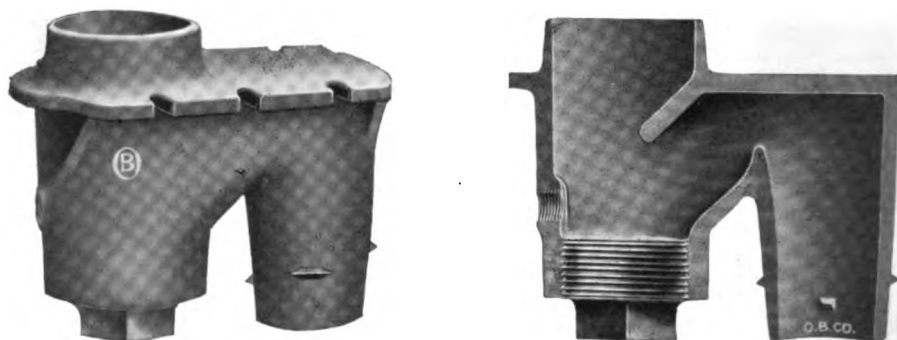
USED with the O-B Sand Trap shown on the following page and should be attached on the outside of the spout of the trap.

A standard $2\frac{1}{4}$ -inch cotton hose may be placed over the wire hose, if desired.

Code Word	No.	List Each
<i>Ostend.</i>	11557—Wire Hose, 42 inches long, 2-inch inside diameter	\$1 80

O-B Air Sand Trap

Form 1



TRAP is very compact, thus economizing space where it is often needed, can be placed in any convenient location on car where hose will properly reach the wheels, sand cannot get out except by an application of air, and there are no moving parts to get out of order.

Consists of a one-piece casting fitted with a 2-inch pipe plug, sherardized to prevent its rusting fast in Trap.

By removing pipe plug it is easy to rid Trap of caked or frozen sand.

The curved surfaces inside the Trap offer a minimum resistance to flow of sand when under air pressure and facilitate cleaning.

Width of flanged top of Trap $4\frac{1}{2}$ inches, length $6\frac{1}{2}$ inches. Height of Trap overall from flanged top to end of hose connection $4\frac{1}{2}$ inches, weight 6 pounds. Hole in Trap for air blast pipe is threaded for $\frac{1}{4}$ -inch iron pipe.

A wire hose 2 inches inside diameter should be attached to the outside of the spout and a standard $2\frac{1}{2}$ -inch cotton hose may be placed over the wire hose, if desired.

Code Word
Facingly.

No. 10038—O-B Air Sand Trap, Malleable Iron, Japanned \$2 20

List Each

Air Reducing Valve



THIS Valve is used in the air line of air sander equipment as a throttle and can be adjusted so that only sufficient air can pass to cause the proper flow of sand when the sander valve is wide open.

Code Word	No.	List Each
<i>Hurlbat.</i>	8282— $\frac{1}{2}$ -inch Reducing Valve.....	\$0 55
<i>Hurlwind.</i>	10648— $\frac{1}{2}$ " " ".....	90

Trailer Connector



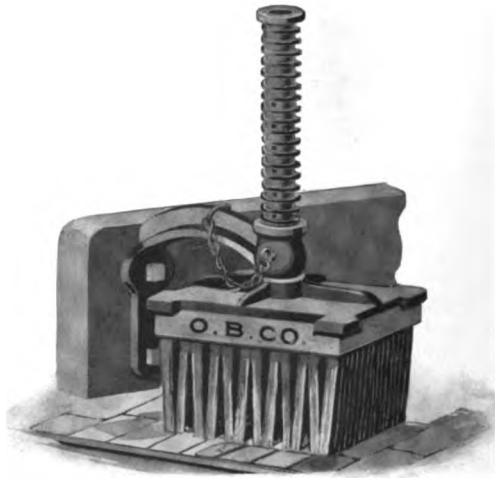
A SIMPLE and efficient form of Connector for coupling trailer and motor car lighting circuits and for similar work. The device is so designed that, when uncoupled, all exposed parts are "dead," thus eliminating the possibility of shock.

Each end of the Connector is supplied with 3 feet of No. 12 flexible insulated cable, securely soldered in place.

Code Word	No.	List Each
<i>Interr.</i>	11023—Trailer Connector, complete as shown.....	\$0 60

Adjustable Track Brush Holder

Patented



Holder for V-Shaped and Upright Guard Boards, in raised position, complete with Top Plate and Track Brush.

THE working parts of the Adjustable Track Brush Holder are few in number and simple in design, being of such a nature that they are not liable to get out of repair; no bolts, set screws or nuts being used in the adjusting parts. In the event of the cotter pin being accidentally removed or becoming useless, the elasticity of the spring lifts the broom clear of the rail and entirely out of the way of danger; the broom in this case simply failing to perform its work. The pipe standard is of sufficient length to permit the use of track brooms with varying lengths of wires, also to allow for the natural wear of them in service, the holes in the pipe being drilled closely together, and a nicety of adjustment thus provided for. The brooms are lowered on to the rail by removing the cotter pin from the Holder, then depressing the pipe standard, and inserting the pin again in whichever one of the holes in the pipe that will best give the desired tension. In raising the brooms the cotter pin is taken out and the elasticity of the steel spring lifts them clear of the rail. It is advisable, however, to lock the pipe standard so that the weight of the broom will be taken from the spring by placing the pin in the lowest hole in the pipe.

See listing on the following page.

Adjustable Track Brush Holder

Continued

In placing the Track Brush Holders in position on the guard board they should be set so that sufficient clearance from the rail will be given to the track brooms when in the raised or "off" position, and due allowance should also be made for the wear of the steel wires of the brooms so that the pipe standard can always be depressed sufficiently to give them the required adjustment.

For sloping guard boards it will be found advisable to so change the hanger irons on them that the boards will be placed in an upright position.

Code Word	No.	List Price
<i>Factious.</i>	1821—Holder only, for V-Shaped and Upright Guard Boards.....	Per set of 4, \$16 75
<i>Factious.</i>	8045—Top Plate for No. 1552 Track Brush.....	" " 4, 4 40
<i>Factial.</i>	8047— " " 2136 " "	" " 4, 2 65

The price on Holder does not include Top Plates or Track Brushes, which must be ordered separately.

Steel Wire Track Brushes



No. 2136

THESE Track Brushes are for use with the Adjustable Track Brush Holder listed above. The wire used is made from a high grade of steel, which is especially oil-tempered for the purpose. The backing in which the wires are fastened is a heavy, hard wood block.

Code Word	No.	Style	Length	Width	Length Wire	List per Dozen
<i>Facture.</i>	1552	Brush for No. 8045 Top Plate	8½	6½	6	\$31 70
<i>Factully.</i>	2136	" " 8047 " "	8	4	4½	12 65

O-B Electric Car Signal System

AFTER a series of most exhaustive experiments and actual tests in service under all operating conditions we have succeeded in perfecting, and are now offering to the trade, an Electric Signal System which provides a simple, efficient and reliable set of signals for classification and rear end markers for electric cars.

It will operate at all times regardless of whether the car is receiving energy from the line or not and is so easy to operate and maintain that it can be depended upon to work satisfactorily with reasonable care on part of the trainmen and car barn men.

This signal will replace the very unsatisfactory oil lamps hitherto necessary because of the absence of a perfect electric car signal system.

The advantages of the O-B Electric System over oil may be summed up as follows:

- (a) Economy of operation and maintenance.
- (b) Cleanliness, because of absence of smoke and oil. The lenses are always clean, insuring a bright, clear signal.
- (c) The signals *always* burn, as the electric lights cannot jar out or blow out—a common occurrence with oil signals.
- (d) Always ready for immediate use and no time lost in starting out cars.
- (e) Absolutely no fire risk.
- (f) Permanently attached to cars so that signals cannot be forgotten—the throwing of the switch puts the signals in operation.
- (g) If desired system can be arranged to light a pilot lamp within the car in case of failure of the main trolley current. This will dimly light the car and at the same time indicate to the conductor that his signals are operating.

It is a well known fact that oil lamps are very unreliable, because they jar out or blow out quite readily. Every road has trouble from time to time with the oil used and it is found almost impossible to keep the lights burning with some of the oil received, making it necessary to doctor the oil in order to make it burn properly. The result is often a period of several days of practically no protection to the cars, because the trainmen cannot keep the lights burning.

O-B Electric Car Signal System

Continued

The cost of maintenance of oil signals mounts up rapidly on account of the attendance required, the oil used, the depreciation of the removable lanterns from rough handling, the necessity for repair parts, such as wicks, burners, lenses, etc., and loss from theft.

In the O-B System each Signal Lantern is normally illuminated by a 16 c. p. lamp connected directly to the trolley circuit. In each lantern, however, there is placed a low voltage battery lamp which, in case the trolley lamps fail to burn for any reason, is automatically lighted by the operation of a positive Relay connected in series with the main signal lamps. This Relay is also adjusted to automatically cut in when the main signal lamp burns too dimly to give a clear signal.

Current for lighting the low voltage auxiliary lamp is supplied by an especially designed Accumulator (storage battery) which is maintained automatically in a charged condition.

The Accumulator was especially designed for the service requirements of this system after a long series of experiments to determine upon the features most desirable. It is $14\frac{1}{2}$ inches high, $8\frac{1}{2}$ inches wide and $11\frac{1}{2}$ inches long, and may be placed in any convenient location. The battery jars are extra heavy hard rubber and are mounted in a strong treated oak case with an elastic insulating compound surrounding each jar. The elements are of a special type and are capable of continuous use under the most trying service conditions. Every detail has been carefully worked out in preparing this design in order that the battery be as nearly "fool proof" as possible. Expense has not been spared to attain this end, and the battery is the best that can possibly be produced.

The low voltage lamps are especially constructed to withstand the vibration on electric cars, and as Tungsten filaments are used, a brilliant light with a minimum current consumption is assured.

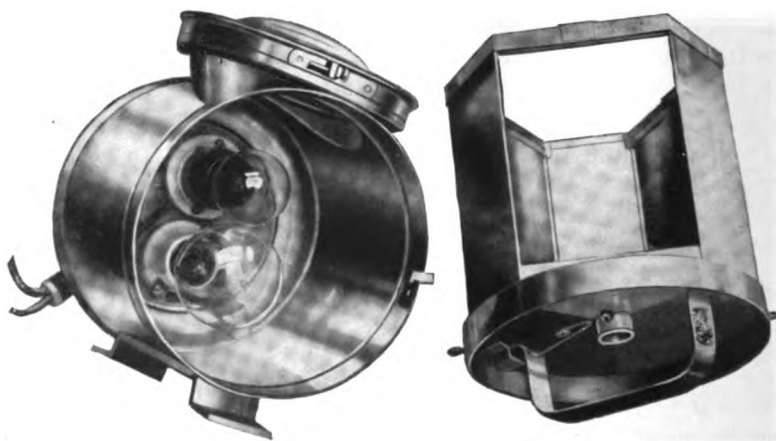
As only one circuit of 16 c. p. lamps is used to make up the main signal circuit, it is not necessary to disturb the wiring for car lighting circuits on cars already built. A 16 c. p. lamp is contained in each signal lantern so that when fewer than five signal lanterns are used there will be one or more 16 c. p. lamps available for car lighting.

Where oil signal lanterns are in use it is possible, in some cases, to change over the lanterns so as to use them for the O-B Electric Signal System at a slight extra expense.

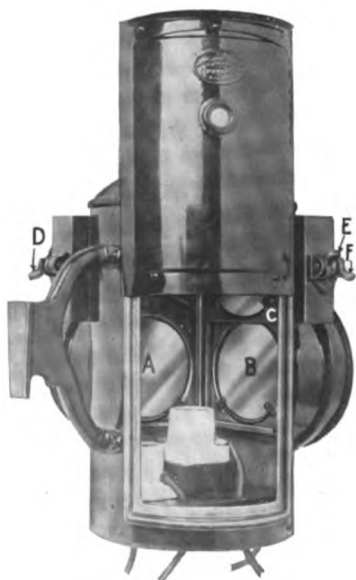
Complete directions for installation have been carefully prepared so that this may be accomplished quickly and easily by anyone at all familiar with car wiring.

O-B Electric Car Signal System

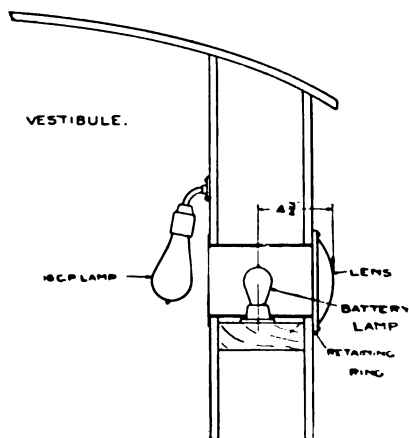
Continued



Showing Interior Construction of Duplex Tri-Color Lantern



Automatic Double Lens Lantern



Method of Using Lens and Retaining Ring

O-B Electric Car Signal System

Continued

Any one of the three different styles of Signal Lanterns or the Semaphore Lens and Retaining Ring, all described below, can be used in connection with this System.

The Duplex Tri-Color Lantern illustrated on the preceding page, has a white semaphore lens and a color-changing device by means of which a white, green or red light can be produced by simply rotating a handle. The bottom of this lantern indicates what color is in use.

The Duplex Tri-Color Lantern being adjustable so that any of the three colors may be turned into position can be used either for a classification or tail light.

The Duplex Ruby Lantern is similar to the Duplex Tri-Color, with the exception that it only has one ruby lens, and is not fitted with a color-changing device. The Duplex Ruby Lantern is intended for use only as a rear end signal or tail light.

The Automatic Double Lens Lantern illustrated on the preceding page is a particularly well constructed lantern for classification or rear end service. It differs from the Duplex Tri-Color Lantern in that it has two lenses, making it possible to show a light on the side of the car as well as to the front or rear.

Each Automatic Double Lens Lantern is equipped with two 5½-inch white semaphore lenses, set at right angles to each other, and three 3½-inch glass color screens mounted inside the lanterns and actuated by thumb levers "D," "E" and "F" outside the case.

The lens opposite the bracket is equipped with a red (B) and green (C) screen, while the side lens is provided with a green color screen (A) only.

The terms "Right Hand" and "Left Hand" as applied to the Automatic Double Lens Lanterns in the listing, refer to their position on the right or left hand side of the end of the car when viewed from the track.

The 5½-inch Ruby Semaphore Lens and Retaining Ring can be used in place of the Duplex Ruby Lantern if the arrangement shown in the diagram on the preceding page is carried out.

O-B Electric Car Signal System

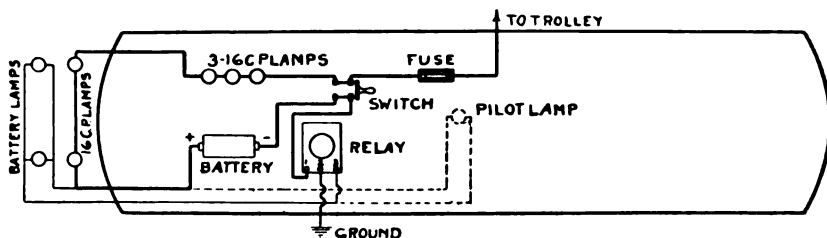
Continued

ON the following pages are diagrams showing five different combinations of signals to meet various conditions of service.

A list of materials indicating the quantities of the various items necessary for each combination is given under each diagram. Wherever the Duplex Ruby Lantern appears in these lists a Semaphore Lens and Retaining Ring may be substituted for it if desired.

Equipment A

For Single End Car with two Red Tail Lights only.



List of material required:

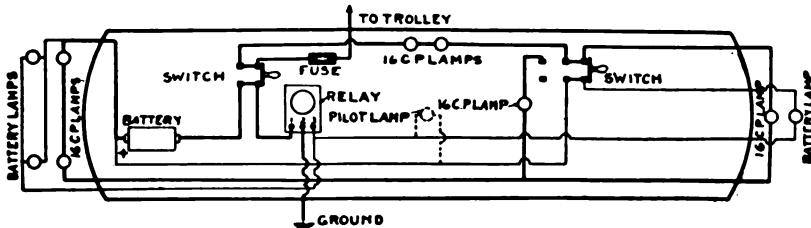
QUANTITY	ITEM	CAT. NO.
1	Relay	10453
1	Accumulator	10312
2	Duplex Ruby Lanterns	10451
3	6-Volt Tungsten Lamps	10313
1	D. P., S. T. Switch	8481
1	Porcelain Fuse Block	9589
1	Enclosed Fuse	10317

See complete listing on page 533.

O-B Electric Car Signal System

Equipment B—Continued

For Single End Car with two Red Tail Lights and one Classification Light.

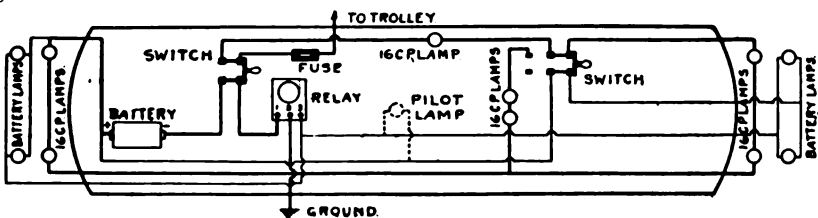


List of material required:

QUANTITY	ITEM	CAT. NO.
1.....	Relay.....	10453
1.....	Accumulator.....	10312
2.....	Duplex Ruby Lanterns.....	10451
1.....	{ Duplex Tri-Color Lantern.....	10452
	or Automatic Double Lens Lantern.....	11021
4.....	6-Volt Tungsten Lamps.....	10313
1.....	D. P., S. T. Switch.....	8481
1.....	D. P., D. T. Switch.....	10316
1.....	Porcelain Fuse Block.....	9589
1.....	Enclosed Fuse.....	10317

Equipment C

For Single End Car with two Red Tail Lights and two Classification Lights.



List of material required:

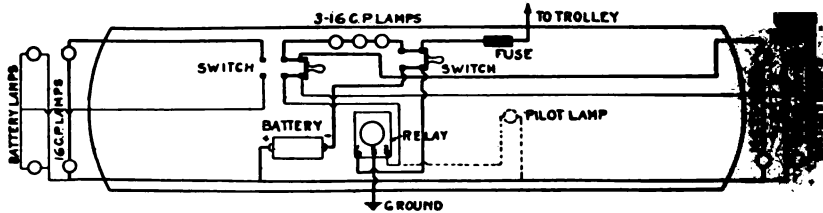
QUANTITY	ITEM	CAT. NO.
1.....	Relay.....	10453
1.....	Accumulator.....	10312
2.....	Duplex Ruby Lanterns.....	10451
2.....	{ Duplex Tri-Color Lanterns.....	10452
	or Automatic Double Lens Lanterns (one each).....	11020-11021
5.....	6-Volt Tungsten Lamps.....	10313
1.....	D. P., S. T. Switch.....	8481
1.....	D. P., D. T. Switch.....	10316
1.....	Porcelain Fuse Block.....	9589
1.....	Enclosed Fuse.....	10317

See complete listing on page 533.

O-B Electric Car Signal System

Equipment D—Continued

For Double End Car with four Red Tail Lights (two at each end).

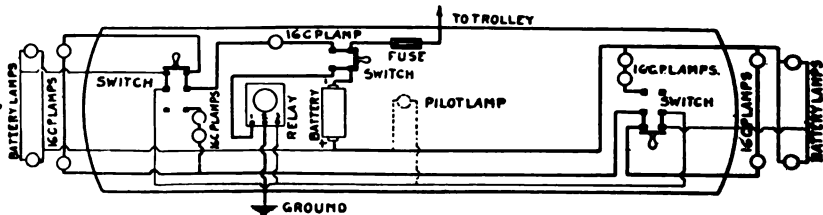


List of material required:

QUANTITY	ITEM	CAT. NO.
1	Relay	10453
1	Accumulator	10312
4	Duplex Ruby Lanterns	10451
5	6-Volt Tungsten Lamps	10313
1	D. P., S. T. Switch	8481
1	D. P., D. T. Switch	10316
1	Porcelain Fuse Block	9589
1	Enclosed Fuse	10317

Equipment E

For Double End Car with four Tri-Color Lanterns (two at each end), one set to be used as Red Tail Lights and the other as Classification Lights, and vice versa.



List of material required:

QUANTITY	ITEM	CAT. NO.
1	Relay	10453
1	Accumulator	10312
4	Duplex Tri-Color Lanterns	10452
	or Automatic Double Lens Lanterns (2 each)	11020-11021
5	6-Volt Tungsten Lamps	10313
1	D. P., S. T. Switch	8481
2	D. P., D. T. Switches	10316
1	Porcelain Fuse Block	9589
1	Enclosed Fuse	10317

See complete listing on page 533.

O-B Electric Car Signal System

Continued



Duplex Tri-Color Lantern. No. 10452



Automatic Double Lens Lantern. No. 11020

Code Word	No.	List Each
<i>Fagging.</i>	10453—Car Signal Relay.....	\$ 7 70
<i>Faulance.</i>	10312—“ “ Accumulator.....	39 60
<i>Fairily.</i>	10451—Duplex Ruby Lantern.....	6 60
<i>Falcade.</i>	10452—“ Tri-Color “.....	8 80
<i>Intumesce.</i>	11020—Automatic Double Lens Lantern, Right Hand.....	13 20
<i>Inuloid.</i>	11021—“ “ “ Left “.....	13 20
<i>Invade.</i>	11022—Bracket for Mounting Automatic Double Lens Lantern.....	35
<i>Falcer.</i>	9006—Ruby Lens and Retaining Ring.....	2 20
<i>Falsary.</i>	10313—Tungsten Lamp, 4 Candle Power, 6 Volt, Ed. Base.....	1 10
<i>Denotate.</i>	8481—Knife Switch, D. P. Single Throw, 25 Amp. 250 V.....	1 25
<i>Famish.</i>	10316—“ “ “ Double “ 25 “ 250 V.....	2 10
<i>Famosity.</i>	9589—Porcelain Fuse Block, 600 V.....	1 00
<i>Famously.</i>	10317—Type B Standard, Enclosed Fuse, 1 Amp. 600 V.....	35

Suggestions for Ordering

If it is not desired to install a pilot lamp inside the car connected to the battery circuit, as shown in the foregoing diagrams, to burn when the trolley current is off, one Tungsten Lamp should be deducted from the list of materials.

A 5 $\frac{3}{8}$ -inch Ruby Semaphore Lens and Retaining Ring, Cat. No. 9006, should be ordered in place of each Duplex Ruby Lantern in Equipments A, B, C and D, if the arrangement shown on page 528 is used.

The foregoing lists of materials do not include any extra parts. A number of extra Tungsten Lamps should be ordered, and it would be well to order one extra Accumulator for every ten Equipments so as to have one on hand in case of an emergency.

In addition to the material given in the lists a 16 c. p. Edison Base Lamp is required for each Signal Lantern.

A specification Blank giving full directions for ordering will be mailed on request.

For complete description of Signal System see pages 526 to 532.

O-B Car Lighting Circuit Regulator

Patent Applied For



See description and listing on opposite page.

O-B Car Lighting Circuit Regulator

Patent Applied For

Continued

THIS device automatically regulates and controls 500 to 750 volt, D. C. lighting circuits in electric cars, making it possible to obtain a maximum and fairly constant illumination under the voltage variations met with in this class of service.

No changes are necessary in wiring equipment of car as device is installed as easily and quickly as replacing a single lamp.

It consists of a simple, compact magnetic relay and a protecting fuse; the entire mechanism being enclosed in a porcelain case and provided with a standard Edison plug at one end and a standard Edison socket at the other.

One Regulator should be installed in each five-light circuit in the car by removing any one lamp from each series of five and screwing the plug end of the Regulator into the socket thus vacated. The lamp which was removed to make room for the Regulator is then screwed into the socket of the Regulator. The device is then in operating condition.

Relay is arranged so as to cut out the lamp which is screwed in socket of Regulator whenever the voltage across the light circuit has dropped to a pre-determined low point; thus throwing the total reduced voltage upon the four remaining lamps in the same series circuit and thereby producing a much greater total illumination than it would be possible to obtain from all five lamps burning on the reduced voltage.

Operation is absolutely automatic as the relay cuts the fifth lamp in and out of the circuit as the variations in voltage demand.

As regularly furnished for average operating conditions with 60 watt lamps, Regulators are adjusted and tested so as to cut fifth lamp in and out of circuit between 480 and 490 volts.

Regulators can be furnished adjusted so as to meet special conditions and voltages on request.

Code Word	No.	List Each
<i>Ostuary.</i>	12427—Lighting Circuit Regulator.....	\$4 40

Imperial Luminous Arc Headlights

Types LAA and LBA—Two Compartment



Type LAA Headlight. No. 10530

LUMINOUS arc type requires less maintenance than carbon arc and has the additional advantage that no inner globes are required. Upper and lower electrodes will burn for approximately 4000 and 175 hours respectively.

Semaphore lens, 12 inches in diameter, projects narrow beam of light for great distance without aid of a reflector.

Wiring equipment for Type LAA is same as shown on page 540 for Type A Imperial Arc Headlight; that for Type LBA is same as shown on page 541 for Type B.

Height, 14 $\frac{1}{4}$ inches; width, 16 $\frac{1}{4}$ inches; depth, 12 inches.

Type LAA, Combination Arc and Incandescent

Code Word	No.	List Each
<i>Farrow.</i>	10530—Type LAA Headlight, without Wiring Equipment (as shown in cut)	\$39 00
<i>Farthing.</i>	10531—Type LAA Headlight, with complete Wiring Equipment for Single End Car	55 30
<i>Fascine.</i>	10532—Type LAA Headlight, with complete Wiring Equipment for Double End Car	60 25

Type LBA, Arc Only

<i>Fashion.</i>	10533—Type LBA Headlight, without Wiring Equipment	\$35 45
<i>Fatalist.</i>	10534—“ “ with complete Wiring Equipment for Single End Car	51 05
<i>Fateful.</i>	10535—Type LBA Headlight, with complete Wiring Equipment for Double End Car	55 30

Above are manufacturer's list prices effective April 1st, 1914.

See list of parts and accessories on page 547.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Luminous Arc Headlights

Types LCA and LDA—Two Compartment



Type LCA Headlight. No. 10536

LUMINOUS arc type requires less maintenance than carbon arc and has the additional advantage that no inner globes are required. Upper and lower electrodes will burn for approximately 4000 and 175 hours respectively.

Polished aluminum reflector, 12 inches in diameter, gives broader beam of light than semaphore lens but does not project for as great a distance.

Wiring equipment for Type LCA is same as shown on page 540 for Type A Imperial Arc Headlight; that for Type LDA is same as shown on page 541 for Type B.

Height, 14½ inches; width, 16½ inches; depth, 10¾ inches.

Type LCA. Combination Arc and Incandescent

Code Word	No.	List Each
<i>Fathom.</i>	10536—Type LCA Headlight, without Wiring Equipment (as shown in cut)	\$37 55
<i>Fatigale.</i>	10537—Type LCA Headlight, with complete Wiring Equipment for Single End Car.	53 85
<i>Faulter.</i>	10538—Type LCA Headlight, with complete Wiring Equipment for Double End Car.	58 80

Type LDA, Arc Only

<i>Faulting.</i>	10539—Type LDA Headlight, without Wiring Equipment.	\$34 05
<i>Favorer.</i>	10540—“ with complete Wiring Equipment for Single End Car.	49 65
<i>Feaster.</i>	10541—Type LDA Headlight, with complete Wiring Equipment for Double End Car.	53 90

Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Luminous Arc Headlight

Types LGA and LHA—Two Compartment



Type "LGA." with Door Open

SIMILAR to Types LAA and LBA but has shallower case and smaller semaphore lens (diameter $8\frac{3}{8}$ inches), resulting in a slight decrease in projection of the light beam.

Upper and lower electrodes will burn for approximately 4000 and 175 hours respectively.

Wiring equipment for Type LGA is same as shown on page 540 for Type A Imperial Arc Headlight; that for Type LHA is same as shown on page 541 for Type B.

Height, $14\frac{1}{4}$ inches; width, $16\frac{1}{4}$ inches; depth, 8 inches.

Type LGA, Combination Arc and Incandescent

Code Word	No.	List Each
<i>Interrex.</i>	11098—Type LGA Headlight, without Wiring Equipment (as shown in cut).....	\$39 00
<i>Interscind.</i>	11099—Type LGA Headlight, with complete Wiring Equipment for Single End Car.....	55 30
<i>Interter.</i>	11100—Type LGA Headlight, with complete Wiring Equipment for Double End Car.....	60 25

Type LHA, Arc Only

<i>Intervale.</i>	11101—Type LHA Headlight, without Wiring Equipment.....	\$35 45
<i>Intervent.</i>	11102—“ “ with complete Wiring Equipment for Single End Car.....	51 05
<i>Intervisit.</i>	11103—Type LHA Headlight, with complete Wiring Equipment for Double End Car.....	55 30

Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Luminous Arc Headlight

Type LK—Two Compartment



CASE is divided into two compartments. Front compartment contains the electrodes, electrode holders and a 4-inch spherical aluminum reflector. Rear compartment contains the operating mechanism.

This form of construction protects the operating mechanism from the fumes and deposits caused by the consumption of the electrodes and materially increases the life of the former.

All parts within the case are mounted directly to the barrier separating the two compartments. Each compartment is provided with a cast iron door which permits easy access to the interior parts. Front door is fitted with an 8 $\frac{3}{8}$ -inch semaphore lens. No inner globe is required.

Upper and lower electrodes will burn approximately 4000 and 125 hours respectively. Diameter, 12 $\frac{1}{2}$ inches; depth, 8 inches.

Wiring equipment as listed below includes main resistance, dash hanger, plug receptacle, fuse, fuse block, and snap switch.

Code Word	No.	List Each
<i>Ostmen.</i>	11457—Headlight, without Wiring Equipment (as shown in cut) . .	\$25 55
<i>Ostrich.</i>	11458—“ with complete Wiring Equipment for Single End	
	Car.	41 15
<i>Otiose.</i>	11459—Headlight, with complete Wiring Equipment for Double	
	End Car.	45 40

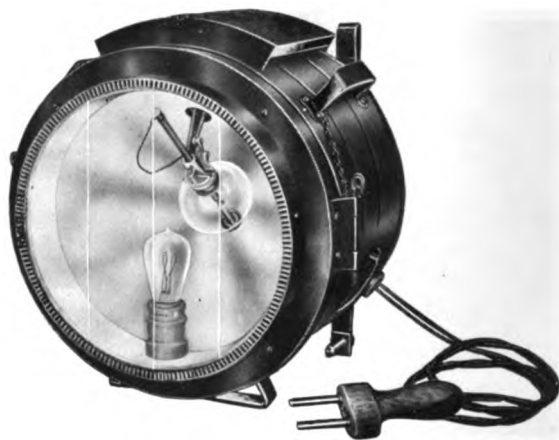
Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Carbon Arc Headlight

Type A—Combination Arc and Incandescent



Type A Headlight. No. 9313

THIS Headlight can be changed from arc to incandescent or vice versa, by simply turning a switch located within reach of the motorman.

Each Headlight is furnished with a 12-inch highly polished parabolic aluminum reflector.

A complete wiring equipment for double end car, as listed below, includes: One main resistance, two dash hangers, two plug receptacles, one fuse and fuse block and two snap switches. The complete wiring equipment for a single end car is same as above, with the exception that only one dash hanger, plug receptacle and switch are required.

When ordering headlights to be used on cars wired for other makes of arc headlights, state type of plug receptacle and distance from center to center of dash hanger, also type of headlight.

Code Word	No.	List Each
<i>Federate.</i>	9313—Headlight, without Wiring Equipment (as shown in cut)	\$32 00
<i>Feigned.</i>	9312—“ with complete Wiring Equipment for Single End Car	46 45
<i>Felicitify.</i>	9311—Headlight, with complete Wiring Equipment for Double End Car	49 55

Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

One extra inner globe and 2 extra upper and lower carbons are furnished with each equipment.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Carbon Arc Headlight

Type B



Type B Headlight. No. 9316

THE Type B Imperial Arc Headlight is exactly similar to the Type A illustrated on the preceding page, except that it does not have the incandescent lamp attachment.

This Headlight is furnished with a 12-inch highly polished parabolic aluminum reflector.

A complete wiring equipment for double end car, as listed below, includes: One main resistance, two dash hangers, two plug receptacles, one fuse and fuse block and two snap switches. The complete wiring equipment for a single end car is same as above with the exception that only one dash hanger, plug receptacle and switch are required.

When ordering headlights to be used on cars wired for other makes of arc headlights, state type of plug receptacle and distance from center to center of dash hanger, also type of headlight.

Code Word	No.	List Each
<i>Felsite.</i>	9316—Headlight, without Wiring Equipment (as shown in cut) . . .	\$25 00
<i>Fenerale.</i>	9315— " with complete Wiring Equipment for Single End Car . . .	37 90
<i>Ferret.</i>	9314—Headlight, with complete Wiring Equipment for Double End Car . . .	39 45
<i>Foamless.</i>	10476—Dimmer, for use with Type B Headlight . . .	2 30

Above are manufacturer's list prices effective April 1, 1914.

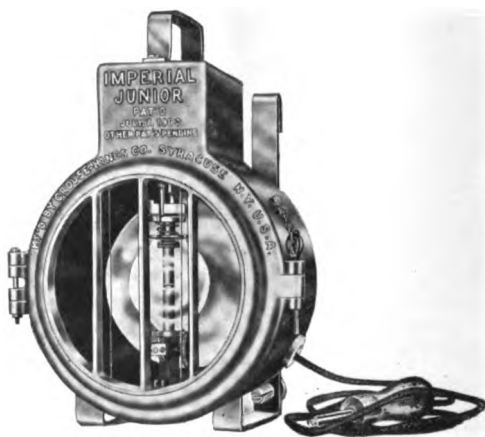
See list of parts and accessories on page 547.

One extra inner globe and 2 extra upper and lower carbons are furnished with each equipment.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Junior Carbon Arc Headlight

Type V



Type V Headlight. No. 10542

THE Junior Arc Headlight is intended for use on city trolley systems which extend into suburbs and pass through poorly lighted streets, as this service demands more illumination than Incandescent Headlights can produce.

The Junior Headlight will project sufficient light to illuminate the track a considerable distance ahead of the car without being too glaring, and the case is too small to interfere with the fender and it will withstand extremely rough usage.

Each Headlight is furnished with a 6-inch highly polished parabolic aluminum reflector.

The wiring equipments for single and double end cars are the same as those mentioned on page 541 for the Type B Headlight.

Code Word	No.	List Each
<i>Fervency.</i>	10542—Headlight, without Wiring Equipment (as shown in cut) . .	\$16 00
<i>Fervor.</i>	10543—“ with complete Wiring Equipment for Single End Car	28 90
<i>Festival.</i>	10544—Headlight, with complete Wiring Equipment for Double End Car	30 45

Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

One extra inner globe and 2 extra upper and lower carbons are furnished with each equipment.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Junior Carbon Arc Headlight

Type VR—For Mine Locomotives



No. 12428

WILL give sufficient light for all ordinary mine requirements. Similar in internal construction to Type V Headlight listed on preceding page.

Rocker Base permits tipping of headlight to either side by removing cotter pin and bolt. This allows replacement of carbons through bottom of headlight case.

Complete wiring equipment as listed below includes one main resistance fuse, fuse block and snap switch.

Height overall, 15 inches; diameter reflector, 8 inches.

Code, Word	No.	List Each
<i>Otology.</i>	12428—Headlight, without Wiring Equipment (as shown in cut) . . .	\$18 00
<i>Otoscope.</i>	12429—Headlight, with complete Wiring Equipment for Single End Operation	30 20
<i>Ottawas.</i>	12430—Headlights (2), with complete Wiring Equipment for Double End Operation	49 05

Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

One extra inner globe and 2 extra upper and lower carbons are furnished with each equipment.

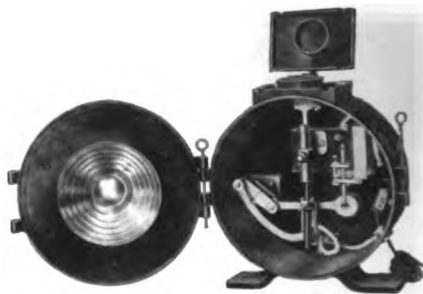
Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Luminous Arc Headlight

Types ML and MLT—For Mine Locomotives



Type MLT—Turret Base



Type ML—Rigid Base

PARTICULARLY suited to mine service because of ability to withstand rough usage and small amount of attention required. Upper and lower electrodes will burn for approximately 4000 and 175 hours respectively before renewal is necessary. Has a heavy cast iron case fitted with 8 $\frac{3}{8}$ -inch semaphore lens.

Made in two styles, one for rigid attachment and the other with a turret base which permits the Headlight to be turned a complete revolution and locked in position.

Turret base feature makes it possible to use one headlight to each locomotive, but this arrangement can only be used where there is sufficient head room to allow it to be mounted on top of the locomotive.

In low vein mines two Headlights are usually required for each locomotive.

A complete wiring equipment, as listed below, includes: One main resistance; one fuse; one fuse block and one snap switch.

Code Word	No.	List Each
<i>Leevard.</i>	11393—Type ML Headlight, Rigid Base, without Wiring Equipment .	\$40 40
<i>Legacy.</i>	11394—“ “ Rigid Base, with complete Wiring Equipment for Single End Operation.....	56 70
<i>Legalism.</i>	11395—Type ML Headlights (2), Rigid Base, with complete Wiring Equipment for Double End Operation.....	98 50
<i>Legality.</i>	11396—Type MLT Headlight, Turret Base, without Wiring Equipment.....	51 05
<i>Legation.</i>	11397—Type MLT Headlight, Turret Base, with complete Wiring Equipment.....	67 35

Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Luminous Arc Headlight

Types MLF and MLFT—For Mine Locomotives



Type MLFT - Turret Base



Type MLF—Rigid Base

SIMILAR in internal construction and operation to Types ML and MLT Headlights listed on preceding page but have lower cases and are, therefore, better adapted for use in low vein mines. Upper and lower electrodes will burn for approximately 4000 and 125 hours respectively before renewal is necessary.

Made in two styles, one for rigid attachment and the other with a turret base which permits the Headlight to be turned a complete revolution and locked in position.

Turret base feature makes it possible to use one Headlight to each locomotive, but this arrangement can only be used where there is sufficient head room to allow it to be mounted on top of the locomotive.

Height, with turret base, $12\frac{1}{4}$ inches; with rigid base, $11\frac{1}{4}$ inches. Diameter lens, $8\frac{3}{8}$ inches.

In low vein mines two Headlights are usually required for each locomotive.

A complete wiring equipment, as listed below, includes: One main resistance; one fuse; one fuse block and one snap switch.

Code Word	No.	List Each
<i>Ottoman.</i>	11460—Type MLF Headlight, Rigid Base, without Wiring Equipment.....	\$40 40
<i>Ounding.</i>	11461—Type MLF Headlight, Rigid Base, with complete Wiring Equipment for Single End Operation.....	56 70
<i>Outact.</i>	11462—Type MLF Headlights (2), Rigid Base, with complete Wiring Equipment for Double End Operation.....	98 50
<i>Outbar.</i>	11463—Type MLFT Headlight, Turret Base, without Wiring Equipment.....	51 05
<i>Outborn.</i>	11464—Type MLFT Headlight, Turret Base, with complete Wiring Equipment.....	67 35

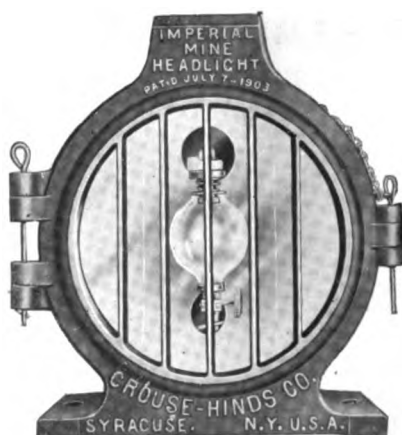
Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Carbon Arc Headlight

Types M and MT—For Mine Locomotives



Type M Headlight. No. 10545

MADE in two styles, one for rigid attachment and the other with a turret base which permits the Headlight to be turned a complete revolution and locked in position.

The turret base feature makes it possible to use one Headlight to each locomotive, but this arrangement can only be used where there is sufficient head room to allow it to be mounted on top of the locomotive.

In low vein mines two Headlights are usually required for each locomotive.

The Headlight has a heavy cast iron case finished with a special weatherproof black enamel fitted with a 9-inch parabolic aluminum reflector.

A complete wiring equipment, as listed below, includes: One main resistance for 3½ Amp., 500 V.; one 6 Amp., 600 V. fuse; one fuse block and one snap switch.

Code Word	No.	List Each
<i>Festoon.</i>	10545—Type M Headlight, Rigid Base, without Wiring Equipment (as shown in cut).....	\$28 00
<i>Fetcher.</i>	10546—Type M Headlight, Rigid Base, with complete Wiring Equipment for Single End Operation.....	40 20
<i>Fettered.</i>	10547—Type M Headlights (2), Rigid Base, with complete Wiring Equipment for Double End Operation.....	69 05
<i>Fetuous.</i>	10548—Type MT Headlight, Turret Base, without Wiring Equipment.....	38 65
<i>Feudal.</i>	10549—Type MT Headlight, Turret Base, with complete Wiring Equipment.....	50 85

Above are manufacturer's list prices effective April 1, 1914.

See list of parts and accessories on page 547.

One extra inner globe and 2 extra upper and lower carbons are furnished with each equipment.

Above Headlights are for Direct Current only; voltage should be specified on all orders or inquiries.

Imperial Arc Headlight Parts

Repair Parts for the Imperial Arc Headlights listed on the preceding pages can be furnished promptly. Prices on application.

Semaphore Lens

Lens listed below is made of clear glass. Blue, green or ruby lenses can be furnished to order.

Code Word	No.	List Each
<i>Outbrag.</i>	12431—Semaphore Lens, 8½ inches diameter	\$2 10

Carbons and Inner Globes

For Imperial Arc Headlights

Code Word	No.	List Price
<i>Fibroid.</i>	10000—Upper Carbons for all Headlights in which Carbons are set at an angle. Size ⅞ x 8 inches, per 100	\$3 35
<i>Fiddler.</i>	10001—Upper Carbons for all Headlights in which Carbons are set vertically. Size ¾ x 6 inches, per 100	2 70
<i>Fidget.</i>	10002—Lower Carbons for all Headlights <i>except</i> those used on alternating current. Size ¾ x 4½ inches, per 100	2 10
<i>Fielded.</i>	10003—Lower Carbons for all Headlights used on alternating current. Size ¾ x 4½ inches, per 100	3 00
<i>Figurist.</i>	10004—Inner Globes of clear glass for use with all Headlights with angular Carbons, per dozen	2 40
<i>Filacer.</i>	10006—Inner Globes of clear glass for use with all Headlights with vertical Carbons, per dozen	2 40

Electrodes for Luminous Arc Headlights

Code Word	No.	List Each
<i>Outburst.</i>	11465—Upper Electrodes, length 3½ inches, for all Luminous Arc Headlights	\$1 25
<i>Legerity.</i>	11308—Lower Electrodes, length 5 inches, for all Luminous Arc Headlights, except Types LK, MLF and MLFT	18
<i>Outcast.</i>	11466—Lower Electrodes, length 4 inches, for Types LK, MLF and MLFT Luminous Arc Headlights only	18

Above are manufacturer's list prices effective April 1, 1914.

Type W Headlights

Incandescent



Nos. 10552-10553



Nos. 10554-10555



Nos. 12432-12433

THE Type W Headlights are intended to be attached to the outside of the dash and are made with plain rim door, grid frame door and with $8\frac{3}{8}$ -inch semaphore lens, all with 9-inch parabolic reflectors.

The plain glass is double thick.

All three styles are $14\frac{1}{4}$ inches high and $11\frac{1}{4}$ inches in outside diameter.

The plain rim and grid frame door styles are $4\frac{1}{2}$ inches deep, while the semaphore lens style is $5\frac{1}{2}$ inches in depth.

The prices below do not include an incandescent lamp.

Code Word	No.	List Each
<i>Finative.</i>	10550—Headlight, Plain Door, Aluminum Reflector.....	\$5 20
<i>Finery.</i>	10551—“ “ “ White Enameled Reflector.....	5 20
<i>Finite.</i>	10552—“ “ “ Aluminum Reflector.....	5 55
<i>Finlet.</i>	10553—“ “ “ White Enameled Reflector.....	5 55
<i>Firmity.</i>	10554—“ Semaphore Lens, without Guard, Aluminum Reflector.....	6 90
<i>Fishery.</i>	10555—Headlight, Semaphore Lens, without Guard, White Enameled Reflector.....	6 90
<i>Outcourt.</i>	12432—Headlight, Semaphore Lens, with Guard, Aluminum Reflector.....	7 30
<i>Outcrier.</i>	12433—Headlight, Semaphore Lens, with Guard, White Enameled Reflector.....	7 30

Above are manufacturer's list prices effective April 1, 1914.

Type Z Headlights

Incandescent



Nos. 10558-10559



Nos. 10560-10561



Nos. 12434-12435

TYPE Z Headlights are intended to be mounted flush with the dash and are made with plain rim door, grid frame door and with 8 $\frac{3}{8}$ -inch semaphore lens, all with 10 $\frac{1}{8}$ -inch parabolic reflectors.

All three styles are 12 $\frac{3}{8}$ inches high and 12 $\frac{3}{8}$ inches in outside diameter.

The plain rim door style is 4 $\frac{5}{8}$ inches deep, the grid frame door style is 4 $\frac{1}{2}$ inches deep, and the semaphore lens style is 5 $\frac{1}{8}$ inches deep.

Prices below do not include an incandescent lamp.

When mounted on a wooden dash the Reinforcing Ring should be used as a means of supporting the ends of the boards, as these can be tightly clamped against the flange on the cast iron case of the Headlight by means of this ring.

Code Word	No.	List Each
<i>Fistic.</i>	10556—Headlight, Plain Door, Aluminum Reflector.....	\$5 20
<i>Fixation.</i>	10557—“ “ “ White Enameled Reflector.....	5 20
<i>Flacket.</i>	10558—“ “ “ Aluminum Reflector.....	5 55
<i>Flagship.</i>	10559—“ “ “ White Enameled Reflector.....	5 55
<i>Flanker.</i>	10560—“ “ “ Semaphore Lens, without Guard, Aluminum Re- flector.....	6 90
<i>Outdraw.</i>	10561—Headlight, Semaphore Lens, without Guard, White Enameled Reflector.....	6 90
<i>Outerly.</i>	12434—Headlight, Semaphore Lens, with Guard, Aluminum Re- flector.....	7 30
<i>Outfall.</i>	12435—Headlight, Semaphore Lens, with Guard, White Enameled Reflector.....	7 30
<i>Flative.</i>	10562—Reinforcing Ring for use with Wood Dash.....	50

Above are manufacturer's list prices effective April 1, 1914.

Type ZP Headlight

Incandescent



ARRANGED for flush mounting. Is formed of No. 16 gauge sheet steel and is very strong and of minimum weight. Housing and reflector are made in separate parts, permitting either to be replaced in case of damage.

Door is regularly provided with a spring catch at bottom although on special order it will be furnished with a locking device which can be opened only with a socket wrench.

An adjustable porcelain socket mounted at top of headlight permits any standard incandescent lamp not exceeding 60 watts to be adjusted to focal point of reflector.

Will fit a $10\frac{1}{4}$ to $12\frac{1}{4}$ -inch round hole in dash. Total depth with plain door, $4\frac{1}{4}$ inches; with semaphore lens, 6 inches. Projection front of dash, plain door, $2\frac{1}{8}$ inches; semaphore lens, $3\frac{1}{8}$ inches. Diameter lens, $8\frac{3}{8}$ inches.

Prices do not include an incandescent lamp.

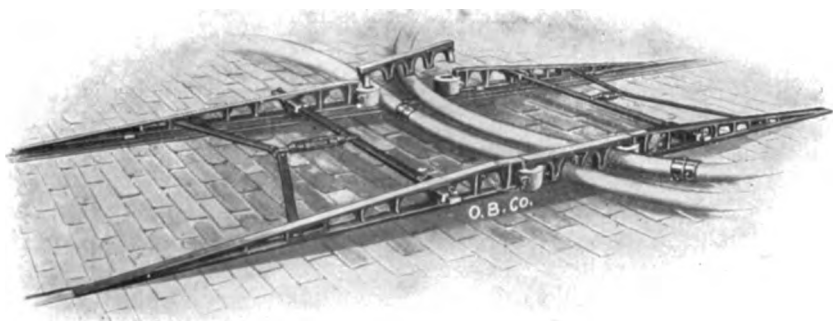
Headlight is furnished for dash of 6 to 8 feet radius; can be furnished for shorter radius dash to order.

Code Word	No.	List Each
<i>Outfly.</i>	11638—Headlight, Plain Door, Aluminum Reflector.....	\$6 30
<i>Outgrow.</i>	11639—“ “ “ White Enameled Reflector.....	6 30
<i>Outing.</i>	11640—“ Semaphore Lens, Aluminum Reflector.....	8 00
<i>Outlaw.</i>	11641—“ “ “ White Enameled Reflector....	8 00

Above are manufacturer's list prices effective April 1, 1914.

Emergency Hose Bridge

Improved Design



THIS Bridge enables cars to run over tracks crossed by fire hose. It consists of two parallel trusses, provided with openings through which several lines of hose may be passed, and so arranged that the trusses are rigidly connected by brace rods, which are placed high enough to clear the pavement. The trusses are secured on top of the rails by lugs which project downward from the lower edge of the trusses, and rest against the side of the rail flange.

The Hose Bridge can be assembled or taken apart quickly, and when "knocked down," can be readily carried on a trouble or emergency wagon. The running surfaces have ample strength to carry any electric cars with perfect safety and the slope toward either end is gradual. Where the Hose Bridge is in use, there can be no blockades or holding of cars on account of fires and often it is not necessary to even break the regular schedule.

Made for either four or six lines of 3-inch hose.

Length of approach is 5 feet 3 inches, maximum height $4\frac{1}{2}$ inches.

Code Word	No.	List Each
<i>Faddle.</i>	9989—Steel Bridge for four lines of Hose, length overall 14 feet.....	\$137 50
<i>Fadedly</i>	10473— " " " six " " " " 15 "	143 00

In ordering Hose Bridges, state the gauge of track on which they are to be used and when for use with cars having rigid pilots, give maximum height between top of rail and pilot, also the distance from the point on the pilot which is immediately over rail, to the center of front wheels and distance between wheel centers on truck.

Tomlinson Automatic Radial Car Coupler

Patented

General Description

THE Tomlinson Coupler illustrated on the following pages is the only radial type of Car Coupler on the market which is absolutely automatic in action, not only when coupling, but also from the fact that as soon as it is uncoupled the interlocking hooks immediately resume their normal position automatically, ready for instant coupling, so that it never becomes necessary to enter between the cars when coupling. There are no parts to be adjusted before a coupling can be made, no knuckles to open, and no loose links, pins or other parts which would be liable to be lost or mislaid.

This Coupler operates with such ease that it is not necessary to set brakes on the car to be coupled, as a very slight contact between the hooks is all that is necessary to make an instantaneous coupling. This feature is very valuable in emergencies, such as fires in car barns, as one man with a motor car could back into a string of any number of cars in a barn and instantly couple all of them and draw them out to a place of safety.

The Tomlinson Coupler uncouples with the greatest ease, as it is only necessary for the trainman to give a light pull on the short chain attached to the unlocking lever on the head of the Coupler. This lever releases the interlocking hooks and the cars can then be moved apart.

The Tomlinson Coupler will intercouple with the various standard radial Couplers now in use without removing or deranging any of the parts of the Coupler. The Couplers will readily adapt themselves to abrupt changes in grade when used with the Spring Drawbar Carrier listed on page 563, an exclusive feature of Tomlinson Couplers.

The body casting is made of malleable iron, and the coupling hook of high carbon steel. Reference to the illustrations on the following pages will show the shape of this hook and also the serrated coupling face of the body casting. This arrangement makes an absolutely rigid coupling, and therefore does away with all surging between cars and greatly facilitates the control of the train.

We guarantee that Tomlinson Couplers will not become uncoupled on curves with either pulling or pushing strains.

A specification blank giving full data for ordering will be furnished on request

See lists and descriptions of Couplers, Draft Gears, etc., on the following pages.

Tomlinson Automatic Radial Car Coupler

Patented

Form 6



USED for city work where loads are not excessive, having ample strength for this service.

Coupler head presents a wide, flat surface which permits inter-coupling if desired, with practically all standard couplers now in use on city cars, making it possible to equip new cars with Tomlinson Couplers without discarding existing coupler equipment (see page 555).

Coupler head and draft gear are in one piece, body terminating in sleeve which receives tail piece.

Form 6 Coupler is used with Form 1 Anchorage listed on page 566 which permits maximum vertical movement, having an eye for a horizontal pin.

Overall length from face of Coupler to center of tail pin is 4 feet, and anchorage takes up 6 inches, giving Coupler an effective overall length of 4 feet 6 inches.

Body casting is malleable iron; tail piece, cast steel, japanned. Hook is forged steel.

Weight, 155 pounds.

Code Word	No.	List Each
<i>Glimmer.</i>	10478—Form 6 Coupler	\$38 50

See general description of Tomlinson Couplers on page 552.

Tomlinson Automatic Radial Car Coupler

Form 6—Continued

Inter-Coupling Feature

No adjustment or change necessary in Tomlinson Coupler.

Note the "face to face" contact of coupler heads.

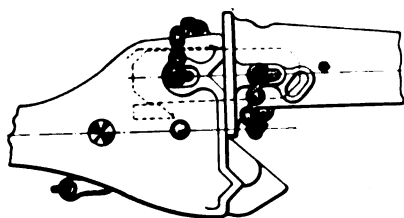


Fig. 1. Tomlinson, Form 6 Coupler Coupled to Van Dorn Coupler

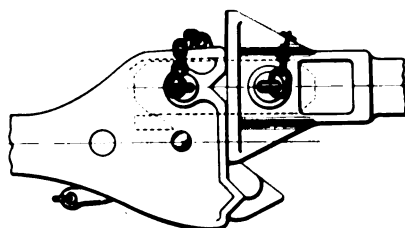


Fig. 2. Tomlinson, Form 6 Coupler Coupled to Brill Coupler

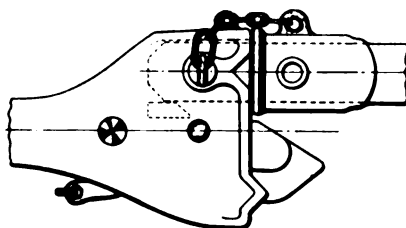


Fig. 3. Tomlinson, Form 6 Coupler Coupled to Standard "Pocket" Coupler

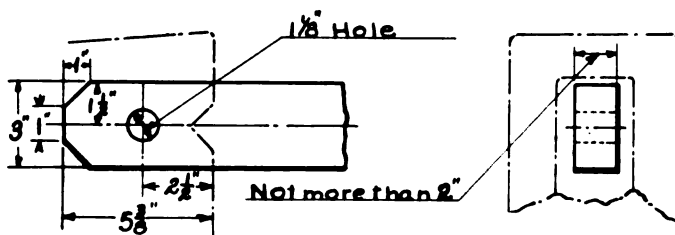
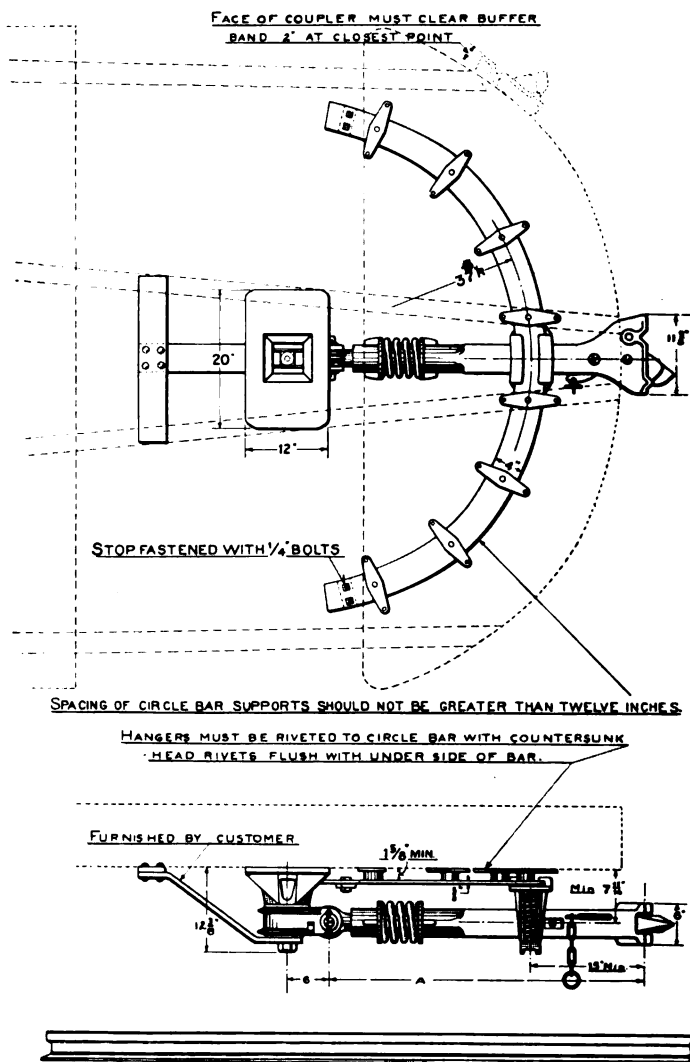


Fig. 4. Recommended Shape and Size of Shackle Bar

See description and listing on pages 552 and 553.

Tomlinson Automatic Radial Car Coupler

Form 6—Continued



Form 6 Coupler Mounted on Car

Note:—Dimension "A" is 4 feet, as regularly furnished.

See description and listing on pages 552 and 553.

Tomlinson Automatic Radial Car Coupler

Patented

Form 8—Air Connecting

THE Form 8 Coupler listed on the following page is very similar to the Form 6 Coupler listed on page 553 except that the Form 8 is equipped with air connections which automatically connect the air lines when two cars are coupled together and is heavier throughout.

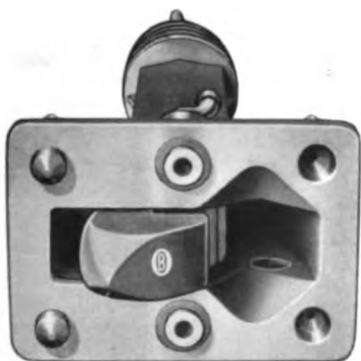


Fig. 1

which screws into a malleable offset fitting (C) seating upon a leather gasket (D).

In the coupling position, opposing gaskets are forced together by the stiff coiled spring (F) making an absolutely air-tight joint regardless of whether the coupler heads are under tension or compression strains.

Offset fitting (C) connects to air pipe line, arrangement of which is shown in illustration on following page.

To remove air gasket sleeve (B) insert end of a $\frac{1}{4} \times \frac{3}{8}$ -inch bar through rubber gasket (A) until lugs on inside of sleeve are engaged and then unscrew sleeve from offset fitting (C).

In coupling, the hooks and guide pins bring the coupler heads into perfect alignment before the gaskets come into contact, thus preventing gaskets from being distorted by rubbing against each other and also insuring a full area of air passage.

Face of Form 8 Coupler is flat instead of being serrated and all vertical and lateral movement between heads is effectively prevented by means of two round steel pins with beveled points on the face of one coupler which fit into corresponding holes in the face of the opposing coupler.

This automatic coupling of air lines is effected by means of flat faced rubber gasket (A), Fig. 2, seated into the head of the bronze sleeve (B),

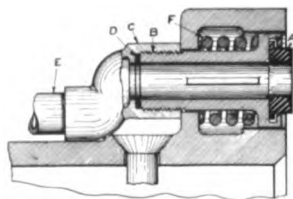


Fig. 2

Tomlinson Automatic Radial Car Coupler

Form 8—Air Connecting

Continued



USED for all classes of city service where any of the various air brake systems are in operation.

Greater saving in time of making up trains and increased safety for employes afforded by automatic air connecting feature will be appreciated and is especially valuable where it is necessary to make up trains under extremely short headway.

Form 8 Coupler is used with Form 1 Anchorage listed on page 566 which has an eye for a horizontal pin, and permits maximum vertical movement.

As usually furnished, overall length from face of hook to center of tail pin is 4 feet.

Anchorage takes up 6 inches, giving Coupler an effective overall length of 4 feet, 6 inches.

Body and tail piece are cast steel, japanned. Hook is forged steel.

Weight, 180 pounds.

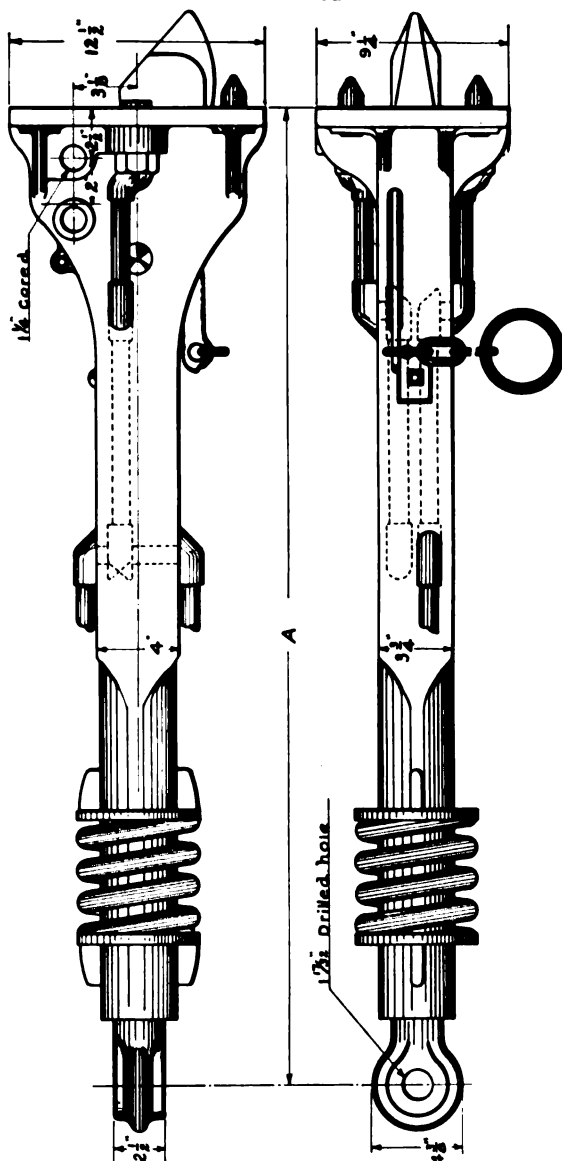
Code Word	No.	List Each
<i>Limpkin.</i>	11430—Form 8 Air Connecting Coupler.....	\$59 40

See general description on page 552 and other data on pages 559 and 560.

Tomlinson Automatic Radial Car Coupler

Form 8—Air Connecting

Continued



Note—Dimension "A" is 4 feet, as regularly furnished.
See description and listing on pages 557 and 558.

Tomlinson Automatic Radial Car Coupler

Patented

Form 16—Air Connecting



USED in subway, elevated and heavy interurban service.

Greater saving in time of making up trains and increased safety for employes afforded by automatic air connecting feature will be appreciated and is especially valuable where it is necessary to make up trains under extremely short headway.

Body and tail piece are cast steel, japanned.

Hook is forged steel.

Code Word
Output.

No.

List Each

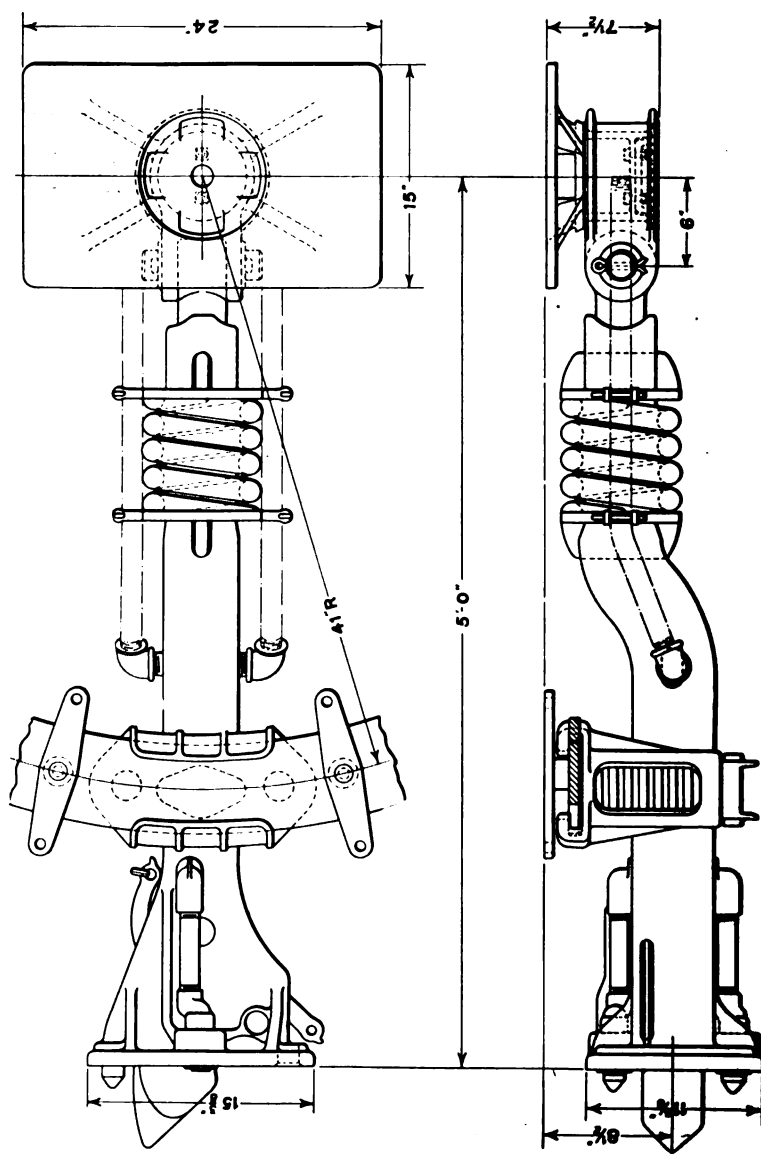
12436—Form 16 Equipment complete for single end, including
Coupler, Anchorage, Spring Draw Bar Carrier, Slide
Bar and six Slide Bar Supports with Rivets.....\$165 00

See dimensions and mounting details on page 562.

Tomlinson Automatic Radial Car Coupler

Patented

Form 16—Air Connecting—Continued



See page 561 for description and listing.

Spring Draw Bar Carrier

Patented

Form 5



OFFERS a yielding support so that abrupt breaks in grade can be passed over without straining the car platforms (see diagrams on page 565).

Also serves to hold the couplers parallel to car sills under normal conditions.

Support yoke has a vertical adjustment for maintaining a uniform height of couplers on all cars and is also provided with lugs intended for carrying air hose connections.

May be used with Form 6 and Form 8 Couplers.

Installation is clearly indicated on diagrams of Coupler mountings shown on preceding pages.

Castings are malleable iron, japanned. Weight, 50 pounds.

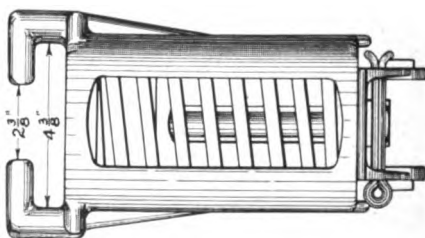
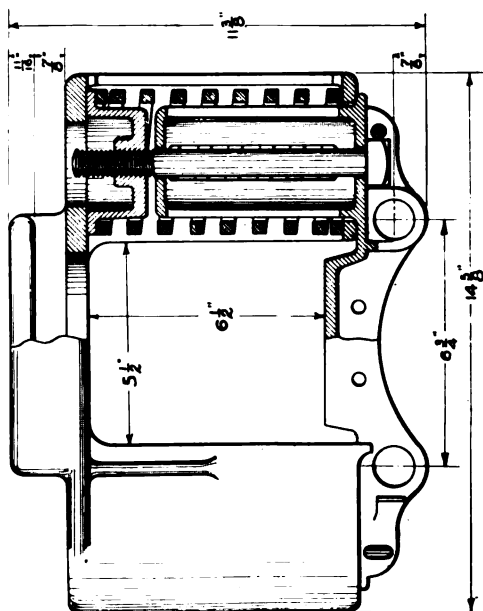
Code Word	No.	List Each
<i>Ligule.</i>	11428—Form 5 Carrier for use with Forms 6 and 8 Couplers.....	\$14 30

See page 564 for dimensions and page 565 for diagrams showing operation of Spring Carrier.

Spring Draw Bar Carrier

Patented

Form 5—Continued

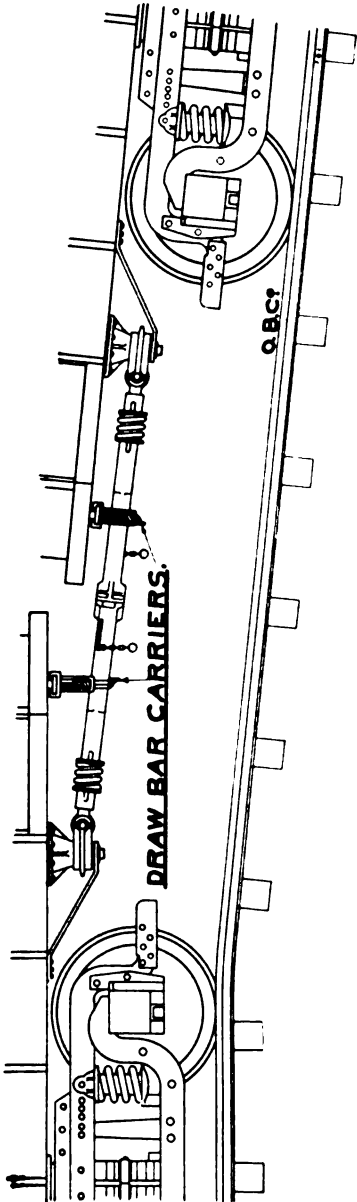


Form 5 Spring Draw Bar Carrier

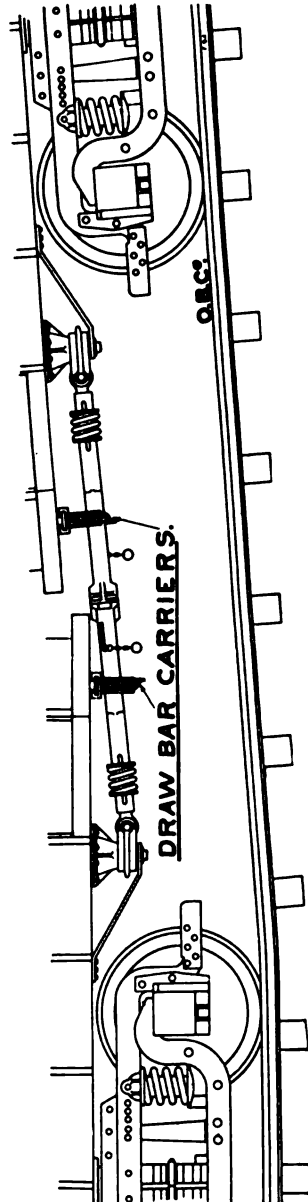
See description and listing on pages 563 and 565.

Spring Draw Bar Carrier

Continued—Patented



Showing Action of Spring Draw Bar Carriers on a Downward Break in Grade

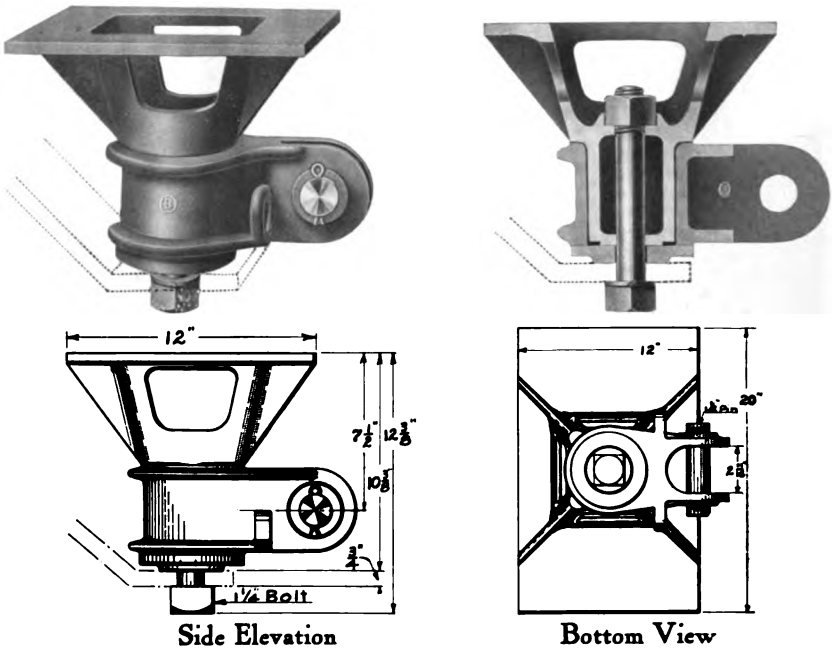


Showing Action of Spring Draw Bar Carriers on an Upward Break in Grade

See description and listing on page 563.

Draw Bar Anchorage

Form 1



FOR use with Forms 6 and 8 Couplers. It permits unrestricted horizontal and vertical movement of Coupler and secures maximum benefit from action of Spring Draw Bar Carrier on abrupt breaks of grade.

Machined fit between tail piece and clevis, also between collar and body, eliminates lost motion and excessive wear on parts.

Top plate is bolted directly to sills and is long enough to span sills of any car. Furnished undrilled so customer can drill to suit conditions.

Because of great variations in car designs, back brace is not included with Anchorage, but its use is recommended wherever conditions permit.

Distance from pivotal center of Anchorage to center of clevis pin is 6 inches, hence effective overall length of Coupler is increased 6 inches and this fact should be borne in mind when determining length of Coupler required.

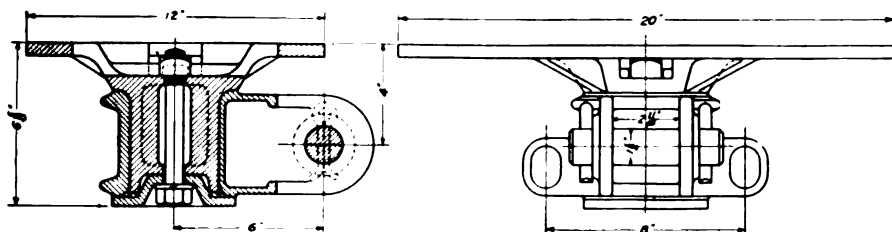
Castings malleable iron, japanned; tail pin, steel. Weight, 85 pounds.

Code Word
Ligation.

No.	List Each
11373—Form 1 Anchorage.....	\$15 95
M. C. B. Anchorage is listed on page 573.	

Draw Bar Anchorage

Form 3



FOR use with Forms 6 and 8 Couplers when car sills do not permit Anchorage to be mounted on same plane as slide bar.

Similar to Form 1 Anchorage listed on preceding page except that it is $3\frac{1}{2}$ inches less in height from center of tail pin to top of Anchorage.

Permits unrestricted horizontal and vertical movement of Coupler and secures maximum benefit from action of Spring Draw Bar Carrier on abrupt breaks of grade.

Machined fit between tail piece and clevis, also between collar and body eliminates loss motion and excessive wear on parts.

Top plate is bolted directly to sills and is long enough to span sills of any car. Furnished undrilled so customer can drill to suit conditions.

Distance from pivotal center of Anchorage to center of clevis pin is 6 inches, hence effective overall length of Coupler is increased 6 inches and this fact should be borne in mind when determining length of Coupler required.

Castings malleable iron, japanned; tail pin, steel. Weight, 80 pounds.

Code Word
Outname.

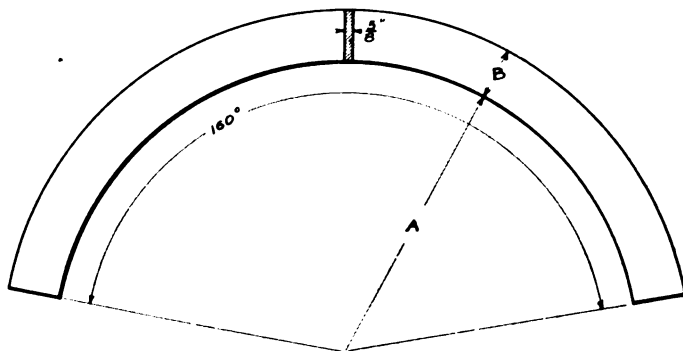
No.
11912—Form 3 Anchorage.....

List Each
\$15 40

M. C. B. Anchorage is listed on page 573.

Carrier Slide Bar

For Form 5 Spring Carrier



USED as a support for the Form 5 Spring Draw Bar Carrier listed on page 563. Bar is attached to car sills by means of counter-sunk head bolts with properly spaced washers, or preferably with Slide Bar Supports, listed on page 569.

Slide Bars are shipped not drilled, as holes must be located to conform to under-framing of car platform.

Slide Bar is $\frac{5}{8}$ inch by 4 inches and is formed on an inside radius of 35 inches.

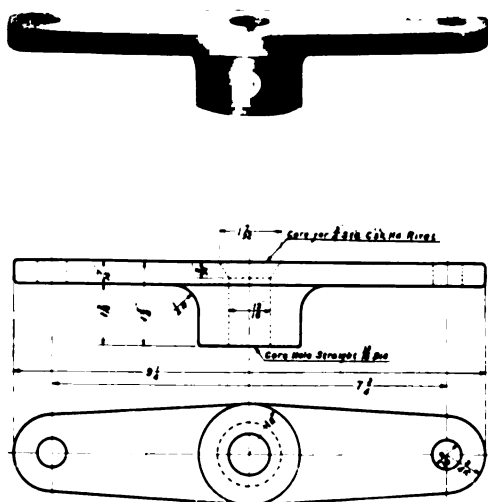
The arc formed by Slide Bar is 160 degrees. Weight, 69 pounds.

Code Word
Linnet.

No.	List Each
11431—Slide Bar for Spring Carrier No. 11428.....	\$8 80

M. C. B. Carrier Slide Bar is listed on page 573.

Slide Bar Support



FOR attaching Carrier Slide Bar listed on page 568 to car sills and allowing sufficient clearance to permit Spring Draw Bar Carrier to move along Slide Bar.

A sufficient number of Slide Bar Supports should be ordered so that when installed, spacing between them will not be greater than 12 inches.

A $\frac{3}{4}$ -inch rivet is included with each of these supports.

Malleable iron, japanned; weight each, $2\frac{3}{4}$ pounds.

Code Word
Flecker.

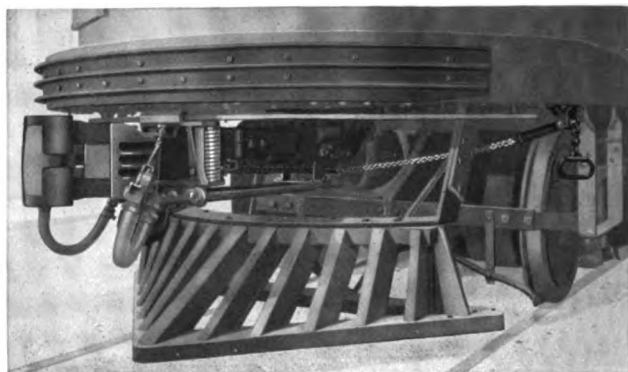
No.	List Each
10495—Slide Bar Support, with Rivet.....	\$0 55

M. C. B. Slide Bar Supports are listed on page 573.

Tomlinson M. C. B. Car Coupler

Patented

Form 12



Showing Complete Tomlinson Equipment Mounted on Car

THE Tomlinson M. C. B. Coupler is a successful adaptation of the standard M. C. B. type of Coupler to comply with all Electric Traction requirements.

It is recommended for use upon cars which, at any time, are coupled with Steam road cars, or Electric Traction cars having any type of M. C. B. Coupler mounted upon them. Also, if it is expected at any future date to handle Steam road cars or enter into "inter-traffic" arrangements with other Electric roads using M. C. B. Couplers.

The Tomlinson M. C. B. will intercouple with any M. C. B. Coupler built upon standard M. C. B. "Contour lines."

An M. C. B. Coupler mounted upon an Electric Road car must eliminate the normal buckling of a standard M. C. B. Coupler. It must also prevent vertical disengagement.

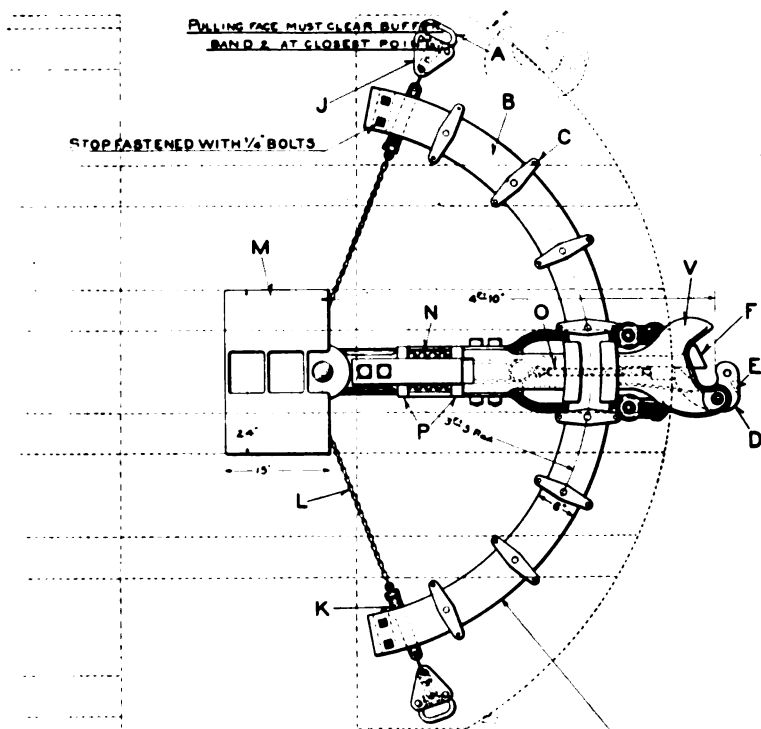
These requirements practically demand a Coupler, the head of which will positively interlock with another of its own kind when coupled. The interlocking features of the Tomlinson M. C. B. Coupler produce the required results.

Other makers of the M. C. B. Coupler cannot introduce effective interlocking without using a Spring Draw Bar Carrier which is an exclusive feature of Tomlinson Couplers.

The Tomlinson unlocking arrangement is flexible so that the Release Handles can be attached at convenient points. The unlocking parts rotate around the same pivotal point as the Coupler, so that they can be kept taut at all times.

Tomlinson M. C. B. Car Coupler

Form 12—Patented—Continued



SPACING OF CIRCLE BAR SUPPORTS SHOULD NOT BE GREATER THAN TWELVE INCHES.

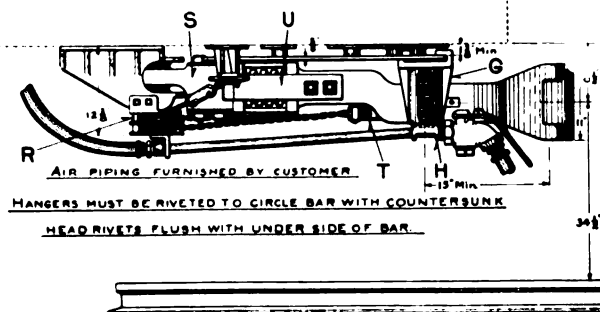


Diagram showing method of mounting

See pages 570 and 573 for description and listing.

Tomlinson M. C. B. Car Coupler

Form 12—Patented

Continued

The diagram drawing on page 571 will show a recess in the face of the Knuckle designated by the letter "E," also Sliding Lock "F."

When two Couplers are connected and Sliding Lock "F" is seated in recess "E," you can readily see that there cannot be any vertical uncoupling, neither can there be appreciable buckling.

It is true that the Sliding Lock is limited in its vertical movement within the recess provided for it, but when it reaches its limit the Spring Draw Bar Carrier, "G" (an exclusive feature of the Tomlinson Coupler) provides for all additional movement required on maximum breaks in grade.

By referring to the illustrations it will be seen that there is an off-set in the Draft Gear of the Coupler which throws the Anchorage Casting well up against the sills of the car. This is a distinct advantage. The lower the Anchorage is placed the greater the strain upon the equipment. The closer to the sills the Anchorage is placed, the less the strain upon car sills and coupler equipment.

Key to Outline Cut on Page 571

- A—Unlocking Handle.
- B—Carrier Slide Bar.
- C—Slide Bar Support with rivet.
- D—Knuckle.
- E—Recess in Knuckle for Sliding Lock.
- F—Sliding Lock.
- G—Spring Carrier.
- H—Air Hose Lugs.
- J—Bracket for holding Unlocking Handle.
- K—Hook Casting incasing Tension Spring.
- L—Pull Chain.
- M—Anchorage.
- N—Double Coil Draft Springs.
- O—Pull Rod and Spring.
- P—Spring Plates.
- R—Sheave Plates and Wheels.
- S—Tail Piece.
- T—Sliding Clevis with Wheel.
- U—Draft Gear Yokes.
- V—Coupler Body Casting.

Tomlinson M. C. B. Car Coupler

Form 12—Patented

Continued

' Key to Listing of Parts Below

Spring Draw Bar Carrier—"G."
 Carrier Slide Bar—"B."
 Carrier Slide Bar Supports—Four of "C."
 Set of Sheave Plates and Wheels—Two Wheels and three Plates
 "R."
 Unlocking Chain with Fittings—Two of "A," two of "J," two of
 "K," one of "L" complete with Connecting Links.
 Anchorage—"M" with Tail Pin.
 Coupler Body—One each of "F," "O," "T" and "V."
 Split Knuckle—"D."
 Draft Gear—One "N," two "P," one "S," two "U" with Bolts.

Code Word	No.	List Each
<i>Oullearn.</i>	11446—Complete M. C. B., Form 12, Equipment for single end including Coupler, Draft Gear, Anchorage, Unlocking Chain with Fittings, Spring Draw Bar Carrier, Carrier Slide Bar and 6 Slide Bar Supports with Rivets.....	\$137 50
NOTE—If purchaser furnishes Carrier Slide Bar and Supports, deduct \$12.50 from list. Weight of complete equipment is about 825 lbs.		

Parts for M. C. B. Coupler

Code Word	No.	List Each
<i>Interposer.</i>	10985—Spring Draw Bar Carrier, M. C. B., Form 12.....	\$22 00
<i>Hostelry.</i>	10034—Carrier Slide Bar.....	13 20
<i>Hostler.</i>	10668—Carrier Slide Bar Support with Rivet.....	70
<i>Housage.</i>	10669—One Set Sheave Plates and Wheels.....	5 50
<i>Hoveler.</i>	10670—Unlocking Chain with Fittings.....	9 90
<i>Huffish.</i>	10671—Anchorage, Form 12.....	19 80
<i>Oullive.</i>	11447—Coupler Body.....	38 50
<i>Humble.</i>	10673—Split Knuckle.....	9 90
<i>Oulloose.</i>	11448—Draft Gear.....	26 40

All castings in the above equipment are malleable iron with the exception of the Body, Knuckles, Coupler Head and the Sliding Lock which are cast steel.

Overhead Materials Required per Mile

Direct Suspension—Cross Span Construction

Single Track Tangent—100 foot Pole Spacing—Wood Poles

- 53 Straight Line Hangers.
- 110 Galvanized Eyebolts with nut and washer.
- 53 $\frac{3}{8}$ -inch Galvanized Steel Strand cross span wires, 30 to 60 feet long.
- 46 Trolley Ears.
- 2 Double Strain Ears.
- 5 Feeder Ears.
- 8 Strain Insulators.
- 2 Trolley Wire Connectors.
- 1 Mile of Trolley Wire.
- 425 Feet of $\frac{3}{8}$ -inch Galvanized Steel Strand for Anchors.
- 352 All Wire Rail Bonds.
- 5 All Wire Cross Bonds.
- 5 Lightning Arresters.

Double Track Tangent—100 foot Pole Spacing—Wood Poles

- 106 Straight Line Hangers.
- 114 Galvanized Eyebolts with nut and washer.
- 53 $\frac{3}{8}$ -inch Galvanized Steel Strand cross span wires, 40 to 60 feet long.
- 92 Trolley Ears.
- 4 Double Strain Ears.
- 10 Feeder Ears.
- 12 Strain Insulators.
- 4 Trolley Wire Connectors.
- 2 Miles of Trolley Wire.
- 850 Feet of $\frac{3}{8}$ -inch Galvanized Steel Strand for Anchors.
- 704 All Wire Bonds.
- 10 All Wire Cross Bonds.
- 5 Lightning Arresters.

For iron pole construction add 106 strain insulators for secondary insulation, to each of the above tables.

Extra Materials Required

The following extra materials are required for curves, turnouts and line sections, the quantities depending upon local conditions:

- | | |
|-------------------------|-------------------------|
| Section Insulators. | Double Curve Pull-Over. |
| Line Section Switches. | Curve Trolley Ears. |
| Frogs. | Strain Insulators. |
| Single Curve Pull-Over. | Hangers. |

Overhead Materials Required per Mile

Direct Suspension—Pole Bracket Suspension

Single Track Tangent—100 foot Pole Spacing

- 53 Flexible Pole Brackets.
- 53 Straight Line Hangers.
- 46 Trolley Ears.
- 2 Double Strain Ears.
- 5 Feeder Ears.
- 8 Strain Insulators.
- 4 Galvanized Eyebolts with nut and washer.
- 2 Trolley Wire Connectors.
- 1 Mile of Trolley Wire.
- 425 Feet of $\frac{1}{8}$ -inch Galvanized Steel Strand for Anchors.
- 352 All Wire Rail Bonds.
- 5 All Wire Cross Bonds.
- 5 Lightning Arresters.

Double Track Tangent—100 foot Pole Spacing

- 106 Flexible Pole Brackets.
- 106 Straight Line Hangers.
- 92 Trolley Ears.
- 4 Double Strain Ears.
- 10 Feeder Ears.
- 12 Strain Insulators.
- 8 Galvanized Eyebolts with nut and washer.
- 4 Trolley Wire Connectors.
- 2 Miles of Trolley Wire.
- 850 Feet of $\frac{1}{8}$ -inch Galvanized Steel Strand for Anchors.
- 704 All Wire Rail Bonds.
- 10 All Wire Cross Bonds.
- 5 Lightning Arresters.

Extra Materials Required

The following extra materials are required for curves, turnouts and line sections, the quantities depending upon local conditions:

- | | |
|-------------------------|-------------------------|
| Section Insulators. | Double Curve Pull-Over. |
| Line Section Switches. | Curve Trolley Ears. |
| Frogs. | Strain Insulators. |
| Single Curve Pull-Over. | Hangers. |

Tables

Comparison of Aluminum and Copper Conductors

THE specific gravity of Aluminum is 2.68 and of Copper 8.93; or in other words, Copper is 3.33 times heavier than Aluminum, volume for volume. The conductivity of Copper varies from 96 to 99 while for Aluminum it varies from 59 to 63. Taking the conductivity of Copper as 97 and of Aluminum as 61, the size of a cable made of Aluminum in order to have the same carrying capacity as that of a Copper cable, would be 1.59 times the area in circular mils of the Copper cable. Thus, a Copper cable of 300000 C. M. area, if replaced by a cable of Aluminum, the Aluminum cable would have an area of 1.59 times 300000 C. M., or 477000 C. M. The comparative weights, therefore, of equal lengths and equal conductivities of Copper and Aluminum cables are as 1 to .48; that is, a cable of Aluminum would weigh 48% of that of a Copper cable of the same length and conductivity.

Comparative Weights of Stranded Copper and Aluminum Cables

No. B. & S. Gauge	Circular Mils.	Diameter		Weights			
		Inches	Nearest 32nd of an Inch	Pounds per 1000 Feet		Pounds per Mile	
				Copper	Aluminum	Copper	Aluminum
	1,000,000	1.152	$1\frac{5}{8}$	3050	920	16104	4860
	950,000	1.125	$1\frac{1}{8}$	2898	874	15299	4617
	900,000	1.092	$1\frac{3}{8}$	2745	828	14494	4374
	850,000	1.062	$1\frac{1}{4}$	2593	782	13688	4131
	800,000	1.035	$1\frac{1}{8}$	2440	736	12883	3888
	750,000	.999	1	2288	690	12078	3645
	700,000	.963	$\frac{31}{32}$	2135	644	11273	3402
	650,000	.927	$\frac{29}{32}$	1983	598	10468	3159
	600,000	.891	$\frac{27}{32}$	1830	552	9662	2916
	550,000	.855	$\frac{25}{32}$	1678	506	8857	2673
	500,000	.819	$\frac{23}{32}$	1525	460	8052	2430
	450,000	.770	$\frac{21}{32}$	1373	414	7247	2187
	400,000	.728	$\frac{19}{32}$	1220	368	6442	1924
	350,000	.679	$\frac{17}{32}$	1068	322	5636	1701
	300,000	.630	$\frac{15}{32}$	915	276	4831	1458
	250,000	.590	$\frac{13}{32}$	762	230	4026	1215
0000	211,600	.530	$\frac{11}{32}$	645	195	3405	1028
000	168,100	.470	$\frac{9}{32}$	513	155	2709	816
00	133,225	.420	$\frac{7}{32}$	406	123	2144	647
0	105,625	.375	$\frac{3}{8}$	322	97	1700	513

Tables

Comparative Weights of Solid Copper and Aluminum Wires

American Gauge, B. & S. No.	Diameter Mils	Area		Weights			
		Circular Mils	Square Inches	Pounds per 1000 Feet		Pounds per Mile	
				Copper	Aluminum	Copper	Aluminum
0000	460	211,600	.166190	641	193	3382	1018
000	410	168,100	.131793	509	153	2687	808
00	365	133,225	.104520	403	121	2129	640
0	325	105,625	.082932	320	96	1688	507
1	289	83,521	.065733	253	76	1335	403
2	258	66,564	.052130	202	60	1064	319
3	229	52,441	.041338	159	48	838	253
4	204	41,616	.032784	126	38	665	201
5	182	33,124	.025998	100	30	529	159
6	162	26,244	.020617	79	24	419	126
7	144	20,736	.016349	63	19	331	100
8	128	16,384	.012966	50	15	262	79
9	114	12,996	.010284	39	12	208	63
10	102	10,404	.008153	32	9	166	49
11	91	8,281	.006467	25	8	132	40
12	81	6,561	.005128	20	6	105	31
13	72	5,184	.004067	15.7	4.720	83	25
14	64	4,096	.003225	12.4	3.743	65	20
15	57	3,249	.002557	9.8	2.968	52	16
16	51	2,601	.002028	7.9	2.354	42	12
17	45	2,025	.001608	6.1	1.867	32	10
18	40	1,600	.001275	4.8	1.480	25.6	7.8
19	36	1,296	.001011	3.9	1.174	20.7	6.2
20	32	1,024	.000802	3.0	.9310	16.4	4.9
21	28.5	812.3	.000636	2.5	.7382	13.0	3.9
22	25.3	640.1	.000504	1.9	.5855	10.2	3.1
23	22.6	510.8	.000400	1.5	.4643	8.2	2.5
24	20.1	404.0	.000317	1.2	.3682	6.5	1.9
25	17.9	320.4	.000251	.97	.2920	5.1	1.5

Tables

Properties of Bare and Insulated Stranded Copper Cable

Size B. & S. Gauge	Area		No. of Wires in Strand	Diameter			Weight—Pounds per 1,000 Feet			Resistance Ohms per 1,000 Ft. at 68° Fahr.
	Circular Mils	Square Inches		Bare	Over Insulation		Bare	Insulated		
					3 Braid	2 Braid		3 Braid	2 Braid	
	2,000,000	1.56874	91	1.6302	2.000	1.875	6204.8	7008	6690	0.00530
	1,750,000	1.36494	91	1.5257	1.906	1.781	5429.3	6193	5894	.00607
	1,500,000	1.17831	91	1.4124	1.781	1.656	4653.6	5380	5098	.00707
	1,250,000	.98170	91	1.2892	1.656	1.531	3878.0	4508	4264	.00852
	1,000,000	.78494	61	1.1520	1.531	1.406	3100.3	3674	3456	.01060
	950,000	.74618	61	1.1232	1.468	1.343	2945.3	3503	3292	.01115
	900,000	.70724	61	1.0935	1.437	1.312	2790.3	3332	3127	.01179
	850,000	.66852	61	1.0629	1.406	1.281	2635.3	3162	2963	.01247
	800,000	.62810	61	1.0305	1.375	1.250	2480.2	2992	2799	.01325
	750,000	.58922	61	.9981	1.343	1.218	2325.2	2822	2635	.01413
	700,000	.54954	61	.9639	1.312	1.187	2170.2	2650	2471	.01514
	650,000	.51020	61	.9288	1.250	1.125	2015.2	2443	2282	.01630
	600,000	.47146	61	.8928	1.234	1.109	1860.2	2235	2083	.01767
	550,000	.43181	37	.8533	1.156	1.031	1703.0	2064	1929	.01925
	500,000	.39237	37	.8134	1.109	1.000	1548.2	1894	1765	.02116
	450,000	.35234	37	.7721	1.062	.937	1393.4	1724	1601	.02349
	400,000	.31431	37	.7280	1.031	.906	1238.5	1553	1436	.02648
	350,000	.27511	19	.6785	.968	.843	1083.34	1345	1248	.03026
	300,000	.23591	19	.6285	.921	.796	926.01	1174	1083	.03531
	250,000	.19635	19	.5738	.875	.750	771.67	985	907	.04233
0000	211,600	.16609	19	.5275	.812	.687	653.14	800	745	.04997
0000	167,772	.13185	7	.4644	.734	.671	512.07	653	604	.06293
00	133,079	.10429	7	.4134	.687	.625	406.98	522	482	.07935
0	105,625	.08303	7	.3684	.640	.578	322.39	424	388	.10007
1	83,694	.06599	7	.3279	.593	.531	255.45	328	303	.12617
2	66,358	.05205	7	.2919	.531	.468	202.50	270	246	.15725
3	52,624	.04132	7	.2601	.468	.421	160.60	206	190	.19827
4	41,738	.03276	7	.2316	.437	.390	127.40	170	155	.25000
6	26,244	.02059	7	.1836	.406	.359	80.10	115	103	.39767

Tables

Properties of Bare and Insulated Solid Copper Wire

Size B. & S. Gauge	Area		Diameter				Weight—Pounds per 1000 Feet			Resistance Ohms per 1,000 Ft. at 68° Fahr.
	Circular Mils.	Square Inches	Bare		Over Insulation		Bare	Insulated		
			Inches	Millimeters	3 Braid	2 Braid		3 Braid	2 Braid	
0000	211,600	.16619	.4600	11.683	.640	.609	640.5	767	723	.04893
000	167,772	.13177	.4096	10.404	.593	.562	507.8	629	587	.06170
00	133,079	.10452	.3648	9.266	.515	.500	402.8	502	467	.07780
0	105,625	.08295	.3250	8.251	.500	.468	319.7	407	377	.09811
1	83,694	.06573	.2893	7.348	.453	.422	253.3	316	294	.12370
2	66,358	.05211	.2576	6.544	.437	.390	200.8	260	239	.15000
3	52,624	.04133	.2294	5.827	.406	.359	159.3	199	185	.19670
4	41,738	.03278	.2043	5.190	.359	.328	126.3	164	151	.24800
6	26,244	.02061	.1620	4.115	.328	.296	80.6	112	100	.39440
8	16,312	.01297	.1285	3.263	.296	.250	49.9	75	66	.62710
10	10,384	.00815	.1019	2.588	.234	.203	31.4	53	46	.99720
12	6,328	.00512	.0808	2.052	.203	.172	19.7	35	30	1.58600
14	4,108	.00322	.0641	1.628	.187	.156	12.4	25	20	2.52100
16	2,580	.00202	.0508	1.291	.172	.125	7.8	20	16	4.00900
18	1,624	.00127	.0403	1.024	.156	.109	4.9	16	12	6.37400
20	1,024	.00080	.0320	.8118	.156	.109	3.1	12	9	10.14000

The resistance of copper wire at 68° Fahr. may be found by the formula: $R = \frac{10354}{\text{Circular Mils.}^2}$

The resistance of copper wire at other temperatures may be found by the formula:
 $R_t = R_{68} [1 + .00225 (t^\circ - 68^\circ)]$

Where t° is the temperature of the wire at which resistance is desired, R_t is the resistance at this temperature and R_{68} is the resistance at 68° F. which may be found per 1000 ft. in the above table.

For example, to find the resistance of 1000 ft. of 0000 copper wire at 75° Fahr.:

$$R_{75} = R_{68} [1 + .00225 (75 - 68)] = .04893 \times 1.01575 = .04968 \text{ ohms}$$

Tables

Tensile Strength of Copper Wire

THE tensile strength of soft copper wire varies from 32,000 to 36,000 pounds per square inch, and of hard copper wire from 45,000 to 68,000 pounds per square inch, according to the degree of hardness.

The following table from Roebling is calculated for 34,000 pounds for soft wire and 60,000 pounds for hard wire, except for some of the larger sizes where the breaking weight is taken at 50,000 lbs. for 0000, 000 and 00, 55,000 for 0 and 57,000 for No. 1.

Numbers B. & S. Gauge	Breaking Weight Pounds		Numbers B. & S. Gauge	Breaking Weight Pounds	
	Hard drawn	Annealed		Hard drawn	Annealed
0000	8,310	5,650	9	617	349
000	6,580	4,480	10	489	277
00	5,226	3,553	11	388	219
0	4,558	2,818	12	307	174
1	3,746	2,234	13	244	138
2	3,127	1,772	14	193	109
3	2,480	1,405	15	153	87
4	1,967	1,114	16	133	69
5	1,559	883	17	97	55
6	1,237	700	18	77	43
7	980	555	19	61	34
8	778	440	20	48	27

Tables

Properties of Galvanized Wire Strand

Diameter	Weight	Breaking Strain in Pounds	
Inches	Pounds per 1000 Feet	Ordinary	Special
$\frac{1}{2}$	510	8,320	16,640
$\frac{5}{16}$	480	7,500	15,000
$\frac{7}{16}$	370	6,000	12,000
$\frac{1}{2}$	300	4,700	9,400
$\frac{1}{4}$	210	3,300	6,600
$\frac{3}{16}$	180	2,600	5,200
$\frac{1}{4}$	115	1,750	3,500
$\frac{7}{16}$	87.5	1,300	2,600
$\frac{1}{4}$	65.0	1,000	2,000
$\frac{1}{2}$	45.0	700	1,400
$\frac{1}{4}$	22.5	375	750
$\frac{3}{16}$	20.0	300	640

GALVANIZED Steel Strand used for span construction is composed of 7 wires twisted into a single strand. The breaking strain varies with the grade of steel used, which runs from 55,000 pounds to 300,000 pounds per square inch. The approximate breaking strain of ordinary and special strand is given in table. Sizes most generally used for supporting trolley wires are $\frac{1}{4}$ and $\frac{3}{8}$ inch. For catenary construction, $\frac{1}{2}$ inch strand is used.

Tables

Structural Steel Tubing

Styles A and C

STRUCTURAL Steel Tubing is now employed extensively in the construction of pole brackets, two styles being used, which are known as Styles A and C respectively. This Tubing is made of a high grade of steel and is stronger and stiffer than welded pipe, and also has considerably more elasticity. The Style C Tubing is of the same weight and dimensions as standard welded pipe, while the Style A Tubing is considerably lighter in weight.

Nominal Inside Diameter	Actual Outside Diameter		Thickness of Metal				Weight			
	Inches	Millimeters	Inches		Millimeters		Pounds per Foot		Kilograms per Meter	
	A & C	A & C	A	C	A	C	A	C	A	C
1½	1.66	42.16	.098	.140	2.49	3.550	1.50	2.2	2.231	3.275
1½	1.90	48.26	.101	.145	2.56	3.685	1.87	2.6	2.782	3.719
2	2.375	60.32	.107	.154	2.72	3.910	2.50	3.6	3.719	5.210

Standard Iron Pipe

STANDARD Iron Pipe is known to the trade by its *nominal* inside diameter, which, however, is not its *actual* inside diameter. A pipe known as 1½-inch pipe will measure 1.38 inches diameter inside, while an extra strong pipe will measure 1.272 inches, the outside diameter of both styles being the same, 1.66 inches.

Pole brackets used for the suspension of trolley wires are usually made from what is known as standard steam gas and water pipe, the sizes in most general use being 1½, 1½ and 2-inch pipe (see Table on opposite page), the 1½-inch being used in the majority of cases.

Standard Trolley Poles are made from both the ordinary and the extra heavy pipe (see Tables on opposite page).

Tables

Standard and Extra Heavy Pipe

Butt and Lap Welded

English and Metric Systems—Standard Pipe

Nominal Inside Diameter		Actual Inside Diameter		Actual Outside Diameter		Thickness of Metal		Weight	
Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Inches	Milli-meters	Pounds per Foot	Kilograms per Meter
$\frac{1}{8}$	3.174	.269	6.83	.405	10.28	.068	1.727	0.24	.355
$\frac{1}{4}$	6.349	.364	9.24	.540	13.71	.088	2.235	0.42	.621
$\frac{3}{8}$	9.524	.493	12.52	.675	17.15	.091	2.311	0.56	.828
$\frac{1}{2}$	12.700	.622	15.79	.840	21.33	.109	2.768	0.84	1.243
$\frac{3}{4}$	19.050	.824	20.93	1.050	26.67	.113	2.870	1.12	1.657
1	25.400	1.047	26.59	1.315	33.40	.134	3.403	1.67	2.471
$1\frac{1}{4}$	31.749	1.380	35.05	1.660	42.16	.140	3.556	2.24	3.315
$1\frac{1}{2}$	38.099	1.610	40.89	1.900	48.26	.145	3.683	2.68	3.966
2	50.799	2.067	52.50	2.375	60.32	.154	3.911	3.61	5.342
$2\frac{1}{2}$	63.499	2.467	62.66	2.875	73.02	.204	5.181	5.74	8.495
3	76.199	3.066	77.87	3.500	88.89	.217	5.511	7.54	11.159
$3\frac{1}{2}$	88.898	3.548	90.12	4.000	101.60	.226	5.740	9.00	13.320
4	101.600	4.026	102.26	4.500	114.30	.237	6.019	10.66	15.776
$4\frac{1}{2}$	114.300	4.508	114.50	5.000	127.00	.246	6.248	12.49	18.485
5	127.000	5.045	128.14	5.563	141.30	.259	6.578	14.50	21.460
6	152.400	6.065	154.05	6.625	168.27	.280	7.111	18.76	27.764
7	177.800	7.023	178.38	7.625	193.67	.301	7.645	23.27	34.439
8	203.200	7.981	202.71	8.625	219.07	.322	8.178	28.18	41.706
9	228.600	8.937	226.99	9.625	244.47	.344	8.737	33.70	49.876
10	254.000	10.018	254.44	10.750	273.05	.366	9.296	40.00	59.200

Extra Heavy Pipe

1	25.400	.951	24.155	1.315	33.40	.182	4.623	2.17	3.229
$1\frac{1}{4}$	31.749	1.272	32.309	1.660	42.16	.194	4.927	3.00	4.464
$1\frac{1}{2}$	38.099	1.494	37.947	1.900	48.26	.203	5.156	3.63	5.402
2	50.799	1.933	49.098	2.375	60.32	.221	5.613	5.02	7.470
$2\frac{1}{2}$	63.499	2.315	58.801	2.875	73.03	.280	7.112	7.67	11.413
3	76.199	2.892	73.456	3.500	88.89	.304	7.722	10.25	15.252
$3\frac{1}{2}$	88.898	3.358	85.293	4.000	101.60	.321	8.153	12.47	18.556
4	101.600	3.818	96.977	4.500	114.30	.341	8.661	14.97	22.276
$4\frac{1}{2}$	114.300	4.280	108.712	5.000	127.00	.360	9.144	18.22	27.113
5	127.000	4.813	122.250	5.563	141.30	.375	9.525	20.54	30.565
6	152.400	5.750	146.050	6.625	168.27	.437	11.099	28.58	42.529
7	177.800	6.625	168.275	7.625	193.67	.500	12.700	37.67	56.056
8	203.200	7.625	193.675	8.625	219.07	.500	12.700	43.00	63.988

Tables

Decimals of an Inch and Millimeters for
Each 1-64th of an Inch

Frac- tion	32nds	64ths	Decimal		Frac- tion	32nds	64ths	Decimal	
			Inches	Millimeters				Inches	Millimeters
$\frac{1}{16}$	1	1	.015625	.3968	$\frac{1}{16}$	17	33	.515625	13.0966
		2	.013125	.7937			34	.531250	13.4934
		3	.046875	1.1906			35	.546875	13.8903
	2	4	.062500	1.5874		18	36	.562500	14.2872
$\frac{1}{8}$	3	5	.078125	1.9843	$\frac{1}{8}$	19	37	.578125	14.6841
		6	.093750	2.3812			38	.593750	15.0809
		7	.109375	2.7780			39	.609375	15.4778
	4	8	.125000	3.1749		20	40	.625000	15.8747
$\frac{3}{16}$	5	9	.140625	3.5718	$\frac{3}{16}$	21	41	.640625	16.2715
		10	.156250	3.9686			42	.656250	16.6684
		11	.171875	4.3655			43	.671875	17.0653
	6	12	.187500	4.7624		22	44	.687500	17.4621
$\frac{1}{4}$	7	13	.203125	5.1592	$\frac{1}{4}$	23	45	.703125	17.8590
		14	.218750	5.5561			46	.718750	18.2559
		15	.234375	5.9530			47	.734375	18.6527
	8	16	.250000	6.3498		24	48	.750000	19.0496
$\frac{5}{16}$	9	17	.265625	6.7467	$\frac{5}{16}$	25	49	.765625	19.4465
		18	.281250	7.1436			50	.781250	19.8433
		19	.296875	7.5404			51	.796875	20.2402
	10	20	.312500	7.9373		26	52	.812500	20.6371
$\frac{3}{8}$	11	21	.328125	8.3342	$\frac{3}{8}$	27	53	.828125	21.0339
		22	.343750	8.7310			54	.843750	21.4308
		23	.359375	9.1279			55	.859375	21.8277
	12	24	.375000	9.5248		28	56	.875000	22.2245
$\frac{7}{16}$	13	25	.390625	9.9216	$\frac{7}{16}$	29	57	.890625	22.6214
		26	.406250	10.3185			58	.906250	23.0183
		27	.421875	10.7154			59	.921875	23.4151
	14	28	.437500	11.1122		30	60	.937500	23.8120
$\frac{1}{2}$	15	29	.453125	11.5091	1	31	61	.953125	24.2089
		30	.468750	11.9060			62	.968750	24.6057
		31	.484375	12.3029			63	.984375	25.0026
	16	32	.500000	12.6997		32	64	1.000000	25.3995

Tables

Metric System of Weights and Measures

Measures of Lengths

1 Millimeter	=	0.001 Meter	=	0.0394	Inch.
1 Centimeter	=	0.01 Meter	=	0.3937	Inch.
1 Decimeter	=	0.1 Meter	=	3.937	Inches.
1 Meter	=	1.	Meter	=	39.37 Inches.
1 Dekameter	=	10.	Meters	=	393.7 Inches.
1 Hectometer	=	100.	Meters	=	328 Feet, 1 Inch.
1 Kilometer	=	1000.	Meters	=	3280 Feet, 10 Inches.
1 Myriameter	=	10000.	Meters	=	6.2137 Miles.

It will be noticed that 10 Millimeters equal 1 Centimeter, 10 Centimeters equal 1 Decimeter, and so on.

Measures of Volumes

1 Milliliter	=	0.001 Liter	=	0.061 Cubic Inch.
1 Centiliter	=	0.01 Liter	=	0.6102 Cubic Inch.
1 Deciliter	=	0.1 Liter	=	6.1022 Cubic Inches.
1 Liter	=	1. Liter	=	0.9081 Quart.
1 Dekaliter	=	10. Liters	=	9.081 Quarts.
1 Hectoliter	=	100. Liters	=	2 Bushels, 3.35 Pecks.
1 Kiloliter	=	1000. Liters	=	1.308 Cubic Yards.

Weights

1 Milligramme	=	0.001 Gramme	=	0.0154 Grain.
1 Centigramme	=	0.01 Gramme	=	0.1543 Grain.
1 Decigramme	=	0.1 Gramme	=	1.5432 Grains.
1 Gramme	=	1. Gramme	=	15.432 Grains.
1 Dekagramme	=	10 Grammes	=	0.3527 Ounce.
1 Hectogramme	=	100. Grammes	=	3.5274 Ounces.
1 Kilogramme	=	1000. Grammes	=	2.2046 Pounds.
1 Myriagramme	=	10000. Grammes	=	22.046 Pounds.

Metric and English Equivalents

Inches	=	Millimeters ÷ 25.4	Lbs. Avoirdupois	=	Kilogrammes x 2.20462
Feet	=	Meters x 3.28083	Tons (2000 lbs.)	=	Kilogrammes ÷ 907.18
Yards	=	Meters x 1.09361	Lbs. per Foot	=	Kilo. per Meter x .67196
Miles	=	Kilometers ÷ 1.60935	Lbs. per Cu. Ft.	=	Kilo. per Cu. Meter x .06243
Sq. In.	=	Square Millimeters x .00155	Sq. Millimeters	=	Square Inches x 645.137
Sq. Ft.	=	Square Meters x 10.7641	Sq. Meter	=	Square Feet x .0929
Acres	=	Square Kilometers x 247.114	Grammes	=	Ounces x 28.3495
Cu. In.	=	Cubic Centimeters ÷ 16.3870	Grammes	=	Pounds x 453.5926
Cu. Ft.	=	Cubic Meters x 35.3140	Kilogrammes	=	Pounds x .45359

Tables

Data for Conversion of English and Metric Systems *

IN transposing the properties of wire from the English to the Metric System and vice versa the following formulæ will be found convenient :

1 Mil = 1-1000 part of an Inch	= .001 Inch.
Circular Mils	= Diameter in Mils, squared.
1 Inch	= 25.4 Millimeters.
1 Kilogramme	= 2.2046 Pounds.
1 Square Mil	= 1.2732 Circular Mils.
1 Circular Mil	= .7854 Square Mil.
1 Millimeter	= 39.37 Mils.
1 Kilogramme per Kilometer	= .67196 Pound per 1000 Feet.
1 Pound per 1000 Feet	= 1.4882 Kilogrammes per Kilometer.
Diameter in Millimeters	= Diameter in Mils ÷ 39.37
Diameter in Mils	= Diameter in Millimeters x 39.37
Area in Square Millimeters	= (Diameter in Millimeters) ² ÷ 1.273
Diameter in Millimeters	= $\sqrt{\text{Area in Square Millimeter} \times 1.273}$
Area in Square Millimeters	= Area in Circular Mils ÷ 1973.5
Area in Circular Mils	= Area in Square Millimeters x 1973.5
Pounds per 1000 Feet	= Weight in Kilogrammes per Kilometer ÷ 1.4882
Kilogrammes per Kilometer	= Weight in Pounds per 1000 Feet ÷ .67196
Pounds per 1000 Feet	= Area in Circular Mils x .003027
Feet per Pound	= 330360 ÷ Circular Mils.

Arcing Distance of High Voltage Alternating Current Between Sharp Needle Points in Air

Adopted by A. I. E. E.

Effective Volts	Inches	Effective Volts	Inches	Effective Volts	Inches
5000	.225	50000	3.55	140,000	13.95
10000	.47	60000	4.65	150,000	15.00
15000	.725	70000	5.85	175,000	17.80
20000	1.000	80,000	7.10	200,000	20.50
25000	1.3	90,000	8.35	250,000	25.60
30000	1.625	100,000	9.60	300,000	31.00
35000	2.00	110,000	10.75	350,000	36.10
40000	2.45	120,000	11.85	400,000	41.20
45000	2.95	130,000	12.95		

Tables

Power Required For Electric Traction

Horse Power and Current Required to Propel One Ton at the following Speeds in Miles per Hour																						
Per Cent Grade	4		6		8		10		12		15		20		25		30		35		40	
	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.	H. P.	Amps.
0	.21	.35	.32	.53	.43	.71	.53	.89	.64	1.06	.80	1.33	1.07	1.78	1.33	2.22	1.60	2.66	1.87	3.11	2.13	3.55
1	.43	.71	.64	1.07	.85	1.42	1.07	1.78	1.28	2.13	1.60	2.67	2.13	3.56	2.67	4.44	3.20	5.33	3.74	6.22		
2	.64	1.07	.96	1.60	1.28	2.13	1.60	2.67	1.92	3.20	2.40	4.00	3.20	5.33	4.00	6.66	4.80	8.00				
3	.85	1.42	1.28	2.13	1.71	2.84	2.13	3.55	2.56	4.45	3.20	5.33	4.27	7.12	5.33	8.88						
4	1.07	1.78	1.60	2.66	2.13	3.55	2.67	4.45	3.20	5.33	4.00	6.66	5.33	8.90								
5	1.28	2.13	1.92	3.20	2.56	4.27	3.20	5.33	3.84	6.40	4.80	8.00										
6	1.49	2.49	2.24	3.73	2.99	4.98	3.74	6.22	4.48	7.48												
7	1.71	2.85	2.56	4.27	3.41	5.69	4.27	7.12														
8	1.92	3.20	2.88	4.80	3.84	6.40																
9	2.13	3.56	3.20	5.33	4.27	7.12																
10	2.35	3.91	3.52	5.87	4.70	7.82																
11	2.56	4.27	3.85	6.40																		
12	2.78	4.63	4.16	6.93																		
13	2.99	4.98																				
14	3.20	5.33																				
15	3.41	5.69																				

The above table is based on the two formulae given below. The formula for horse power per car is given by the Westinghouse Electric & Mfg. Co. as follows:

$$\text{Horse Power} = \frac{\text{Miles per hour} \times \text{tractive effort}}{375}$$

The tractive effort is commonly taken at 20 lbs. per ton on a level and 20 lbs. additional for each per cent grade. For trailers add 12 lbs. per ton.

A formula for the current per car deduced from the above assuming 90 per cent efficiency of motors and 500 volt circuit is as follows:

$$\text{Ampères} = \frac{\text{Mi. per hr.} \times 20 \times (\text{wt. of car in tons plus (wt. car} \times 100 \times \text{per cent grade)})}{225}$$

As an example of the above, suppose it is desired that a 30 ton car ascend a 2 per cent grade at 25 miles per hr.

From the table under the column headed 25 mi. per hr. opposite 2 per cent grade—H. P. per ton = 4.00 and amperes per ton = 6.66; therefore H. P. per car = $30 \times 4.00 = 120$ H. P. and Current per car = $30 \times 6.66 = 200$ Amp.

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